Summary of
Pesticide Use Report Data
2003
Indexed by Commodity

California Department of Pesticide Regulation
P.O. Box 4015
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The *Summary of Pesticide Use Report Data* is available in two formats. One report is indexed by chemical and lists the amount of each pesticide used, the commodity on which it was used, the number of agricultural applications, and the acres/units treated. The second report is indexed by commodity and lists the chemicals used, the number of agricultural applications, amount of pesticides used, and the acres/units treated.

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I. INTRODUCTION

This 2003 *Summary of Pesticide Use Report Data* includes agricultural applications and other selected uses reported in California. The report represents a summary of the data gathered under full use reporting. The Department of Pesticide Regulation (DPR) uses the data to help estimate dietary risk and to ensure compliance with clean air laws and ground water protection regulations. Site-specific use report data, combined with geographic data on endangered species habitats, also helps county agricultural commissioners resolve potential pesticide use conflicts. Detailed, individual pesticide use report data may be obtained from DPR for in-depth, analytical purposes.

To provide public access to the data as soon as possible, DPR is releasing the 2003 data before the majority of error corrections have been completed. Values have been substituted for some errors (see Outliers), but data correction is ongoing.

DEVELOPMENT AND IMPLEMENTATION OF THE PESTICIDE USE REPORTING SYSTEM

Under full use reporting, which began in 1990, California became the first state to require reporting of all agricultural pesticide use, including amounts applied and types of crops or places treated (e.g., structures, roadsides). Commercial applications – including structural fumigation, pest control, and turf applications – must also be reported. The main exceptions to full use reporting are home-and-garden applications, and most industrial and institutional uses. Pesticide use reporting is explained in more detail below.

To enhance accuracy of the data, DPR contracts with agricultural commissioners in the state's 58 counties for the electronic submittal of their pesticide use data. To further improve the accuracy and timeliness of pesticide use data, DPR initiated the California Electronic Data Transfer System (CEDTS) in 1994. This system allows growers and pest control operators to electronically transfer application data to the agricultural commissioners' offices. Although response to CEDTS from pesticide users was favorable, adoption of the reporting system was slow. Many growers and pest control operators lack the time and expertise to write the software that pulls together the necessary pieces of information into a single pesticide use application database that meets DPR's standardized data requirements. In response, private software providers and others began introducing systems that allow use reporting via Internet Web sites in 1999. In addition, new programs are being developed to allow nonagricultural users of pesticides to file electronic reports.

TYPES OF PESTICIDE APPLICATIONS REPORTED

Partial reporting of agricultural pesticide use has been in place in California since at least the 1950s. Beginning in 1970, anyone who used restricted materials was required to file a pesticide use report with the county agricultural commissioner. The criteria established to designate a pesticide as a restricted material include hazard to public health, farm workers, domestic animals, honeybees, the environment, wildlife, or other crops. Restricted materials, with certain exceptions, may be possessed or used only by, or under the supervision of, licensed or certified persons and only in accordance with an annual permit issued by the county agricultural commissioner.

In addition, the State required commercial pest control operators (those in the business of applying pesticides, such as agricultural applicators, structural fumigators, and professional gardeners) to report all pesticides used, whether restricted or nonrestricted. These reports included information about the pesticide applied, when and where the application was made, and the crop involved if the application was in agriculture. The reports were entered into a computerized database and summarized by chemical and crop in annual reports.

With implementation of full use reporting in 1990, the following pesticide uses are required to be reported to the commissioner, who, in turn, reports the data to DPR:

- For the production of any agricultural commodity, except livestock.
- For the treatment of postharvest agricultural commodities.
- For landscape maintenance in parks, golf courses, and cemeteries.
- For roadside and railroad rights-of-way.
- For poultry and fish production.
- Any application of a restricted material.
- Any application of a pesticide with the potential to pollute ground water (listed in section 6800 (b) of the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1) when used outdoors in industrial and institutional settings.
- Any application by a licensed pest control operator.

The primary exceptions to the use reporting requirements are home-and-garden use and most industrial and institutional uses.

HOW PESTICIDE DATA ARE USED

There are several key areas in which data generated by full use reporting are proving beneficial.

Risk Assessment

Without information on actual pesticide use, regulatory agencies conducting risk assessment assume all planted crop acreage is treated with many pesticides, though most crops are treated with just a few chemicals. If the assumptions used by regulatory agencies are incorrect, regulators could make judgments on pesticide risks that are too cautious by several orders of magnitude, reducing the credibility of risk management decisions. The use report data, on the other hand, provides actual use data so DPR can better assess risk and make more realistic risk management decisions.

After the passage of the federal Food Quality Protection Act (FQPA) in 1996, complete pesticide use data became even more important to commodity groups in California and to the U.S. Environmental Protection Agency (U.S. EPA). FQPA contains a new food safety standard against which all pesticide tolerances must be measured. The increased interest in the state’s pesticide use data, especially for calculating percent crop treated, came at a time when DPR was increasing the efficiency with which it produced its annual report. DPR was able to provide up-to-date use data and summaries to commodity groups, University of California specialists, U.S. EPA programs, and other interested parties as they developed the necessary information for the reassessment of existing tolerances.

Worker Health and Safety

Under the reporting regulations, pest control operators must give farmers a written notice after every pesticide application that includes the date and time the application was completed, and the reentry and preharvest intervals (respectively, the intervals between the time a pesticide is applied and when workers may enter the field, and the time of application and when a commodity can be harvested).

This notice gives the farmer accurate information to help keep workers from entering fields prematurely, and also lets the farmer know the earliest date a commodity can be harvested.

DPR's Worker Health and Safety Branch also uses the data for worker exposure assessment as part of developing an overall risk characterization document. Use data helps scientists estimate typical applications and how often pesticides are used.

Public Health

The expanded reporting system provides DPR and the State Department of Health Services with complete pesticide use data for evaluating possible human illness clusters in epidemiological studies.

Endangered Species

DPR has worked with the commissioners to implement an internet database application called PRESCRIBE. This application specifies protection measures that are customized for each pesticide use location, pesticide to be used, and listed species habitat in the area. The database helps commissioners resolve potential conflicts over pesticide use where endangered species may occur. DPR and the commissioners can also examine patterns of pesticide use near habitats to determine the potential impact of proposed use limitations. With location-specific data on pesticide use, restrictions on use can be designed to protect endangered species while still allowing necessary pest control.

Water Quality

In meeting the requirements of the Pesticide Contamination Prevention Act of 1985, site-specific records help track pesticide use in areas known to be susceptible to ground water contamination. Determinations can also be made from the records on whether a contaminated well is physically associated with agricultural practices. These records also provide data to help researchers determine why certain soil types are more prone to ground water contamination.

Since 1983, DPR has had a program to work with the rice industry and the Central Valley Regional Water Quality Control Board to reduce contamination of surface water by rice pesticides. Using PUR data to help in pinpointing specific agricultural practices, more precise alternative use recommendations can be made to assure protection of surface water.

Air Quality

Many pesticide products contain volatile organic compounds (VOCs) that contribute to the formation of smog. DPR worked with the state Air Resources Board to put together a State Implementation Plan under the federal Clean Air Act to reduce emissions of all sources of VOCs, including pesticides, in nonattainment areas of the state. DPR's contribution to the plan included accurate data on the amount of VOCs contained in pesticides and the ability to inventory the use of those pesticides through pesticide use reporting.

Pest Management

The Department uses the PUR database to understand patterns and changes in pest management practices. This information can be used to determine possible alternatives to pesticides that are subject to regulatory actions and to help determine possible impacts of different regulatory actions on pest management.

The PUR is used to help meet the needs of FQPA, which requires pesticide use information for determining the appropriateness of pesticide residue tolerances. As part of this process many commodity groups have created crop profiles, which include information on the pest management practices and available options, both chemical and nonchemical. Pesticide use data is critical to developing these lists of practices and options.

The PUR data have been used to support and assess grant projects for a grant program conducted by DPR to develop, demonstrate and implement reduced-hazard pest management strategies from 1995 to 2003. Due to the statewide budget shortfall, no funds are available to offer grants. Currently, the PUR data is used in several projects that build on work conducted in our grant program in the almond and stonefruit industries. In these and other projects, the PUR data are used to address regional pesticide use patterns and environmental problems such as water and air quality. The data are used to better understand current changes in pesticide use.

DPR has published general analyses of statewide pesticide use patterns and trends. The first analysis covered the years 1991 to 1995, and the second more detailed analysis covered 1991 to 1996. These analyses identified high-use pesticides, the crops to which those pesticides were applied, trends in use, and the pesticides most responsible for changes in use. In addition, since 1997, the annual Summary of Pesticide Use Report Data reports include summary trends of pesticides in several different categories such as carcinogens, reproductive toxins, and ground water contaminants.

Processor and Retailer Requirements

Food processors, produce packers, and retailers often require farmers to submit a complete history of pesticide use on crops. DPR's use report form often satisfies this requirement.

II. COMMENTS AND CLARIFICATIONS OF DATA

The following comments and points should be taken into consideration when analyzing data contained in this report:

TERMINOLOGY

The following terminology is used in this report:

Number of agricultural applications – Number of applications of pesticide product made to production agriculture. More detailed information is given below under "Number of Applications."
Pounds applied – Number of pounds of an active ingredient.
Unit type – The amount listed in this column is one of the following:
A = Acreage
C = Cubic feet (of commodity treated)
K = Thousand cubic feet (of commodity treated)
P = Pounds (of commodity treated)
S = Square feet
T = Tons (of commodity treated)
U = Miscellaneous units (e.g., number of tractors, trees, bins, etc.)

COMMODITY CODES

DPR's pesticide product label database is used to cross-check data entries to determine if the product reported used is registered on the reported commodity. The DPR label database uses a crop coding system based on crop names used by the U.S. EPA to prepare official label language. However, this system caused some problems until DPR modified it in the early 1990s to account for U.S. EPA's grouping of certain crops under generic names. Problems occurred when the label language in the database called a crop by one name, and the use report used another. For example, a grower may have reported a pesticide use on "almonds," but the actual label on the pesticide product--coded into the database--stated the pesticide was to be used on "nuts." To eliminate records being rejected as "errors" because the specific commodity listed on the use report is not on the label, DPR modified the database. To designate a commodity not specifically listed on the label as a correct use, a qualifier code is appended to the commodity code in the label database. A qualifier code would be attached to the "almond" code when nuts are only listed on the label. This system greatly reduces the number of rejections.

Plants and commodities grown in greenhouse and nursery operations represented a challenge in use reporting because of their diversity. Six commodity groupings were suggested by industry in 1990 and incorporate terminology that are generally known and accepted. The six use reporting categories are: greenhouse-grown cut flowers or greens; outdoor-grown cut flowers or greens; greenhouse-grown plants in containers; outdoor container/field-grown plants; greenhouse-grown transplants/propagative material; and outdoor-grown transplants/propagative material.

Tomatoes and grapes were also separated into two categories because of public and processor interest in differentiating pesticide use. Tomatoes are assigned two codes to differentiate between fresh market and processing categories. One code was assigned to table grapes, which includes grapes grown for fresh market, raisins, canning, or juicing. A second code was assigned to wine grapes.

UNREGISTERED USE

The report contains entries that reflect the use of a pesticide on a commodity for which the pesticide is not currently registered. This sometimes occurs because the original use report was in error, that is, either the pesticide or the commodity was inaccurately reported. DPR's computer program checks that the commodity is listed on the label, but nonetheless such errors appear in the PUR, possibly because of errors in the label database. Also, the computer program does not check whether the pesticide product was registered at the time of application. For example, parathion (ethyl parathion) is shown reported on crops after most uses were suspended in 1992. (These records continue to be researched and corrected.) DPR is continuing to implement methods to identify and reduce these types of reporting errors in future reports. Other instances may occur because by law, growers are sometimes allowed to use stock they have on hand of a pesticide product that has been withdrawn from the market by the manufacturer or suspended or canceled by regulatory authorities.

Other reporting "errors" may occur when a pesticide is applied directly to a site to control a particular pest, but is not applied directly to the crop in the field. A grower may use an herbicide to treat weeds on the edge of a field, a fumigant on bare soil prior to planting, or a rodenticide to treat rodent burrows. For example, reporting the use of the herbicide glyphosate on tomatoes – when it was actually applied to bare soil prior to planting the tomatoes – could be perceived to be an error. Although technically incorrect, recording the data as if the application were made directly to the commodity provides valuable crop usage information for DPR's regulatory program.

ADJUVANTS

Data on spray adjuvants (including emulsifiers, wetting agents, foam suppressants, and other efficacy enhancers), not reported before full use reporting, are now included. Examples of these types of chemicals include the "alkyls" and some petroleum distillates. (Adjuvants are exempt from federal registration requirements, but must be registered as pesticides in California.) Pounds of active ingredient are included on the state and county summary reports. Only pounds of product are available on the county CDs.

ZERO POUNDS APPLIED

There are a few entries in this report in which the total pounds applied for certain active ingredients are displayed as zero. This is because the chemical (active ingredient) made up a very small percentage of the formulated product that was used. When these products are applied in extremely low quantities, the resulting value of the active ingredient is too low to register an amount.

ACRES TREATED

The summary information in this annual report cannot be used to determine the total number of acres of a crop to which pesticides were applied during the year. Sometimes the product used contains more than one active ingredient. (In any pesticide product, the active ingredient is the component which kills, or otherwise controls, target pests. A pesticide product is made up of one or more active ingredients, as well as one or more inert ingredients.) For example, if a 20-acre field is treated with a product that contains three different pesticide active ingredients, a use report is filed by the farmer correctly recording the application of a single pesticide product to 20 acres. However, in the summary tables, the three different active ingredients will each have recorded 20 acres treated. Adding these values results in a total of 60 acres as being treated instead of the 20 acres actually treated. A similar problem occurs when the same field is treated more than once in the year with the same active ingredient.

NUMBER OF APPLICATIONS

The values for number of applications include only production agricultural applications. Applicators are required to submit one of two basic types of use reports, a production agricultural report or a monthly summary report. The production agricultural report must include information for each application. The monthly summary report, for all uses other than production agriculture, includes only monthly totals for all applications of pesticide product, site or commodity, and applicator. The total number of applications in the monthly summary reports are not consistently given so they are no longer included in the totals. In the annual PUR reports before 1997, each monthly summary report was counted as one application.

In the annual summary report by commodity, the total number of applications given for each commodity may not equal the sum of all applications of each active ingredient on that commodity. As explained above, some pesticide products contain more than one active ingredient. If the number of applications were summed for each active ingredient in such a product, the total number of applications would be more than one, even though only one application of the product was made. The totals given in the annual summary report take into account such multiple active ingredient products and counts each as only one application.

OUTLIERS

In calculating the total pounds of pesticides used in these tables, DPR excluded values for rates of use which were so large they were probably in error. Errors occur, for example, when those reporting pesticide use shift decimal points during data entry. In the late 1990s, DPR specialists spent more than a year developing, testing, and implementing software to detect probable errors (outliers). Pesticide rates were considered outliers if (1) they were higher than 200 pounds of active ingredient per acre (or greater than 1,000 pounds per acre for fumigants); (2) they were 50 times larger than the median rate for all uses with the same pesticide product, crop treated, unit treated, and record type (that is, production agricultural or all other use); or (3) they were higher than a value determined by a neural network procedure that approximates what a group of 12 scientists believed were obvious outliers. Although these criteria removed less than one percent of the rate values in the PUR, some rates were so large that if included in the sums, they would have significantly affected total pounds applied of some pesticides. (The outliers are excluded from the total pounds in the summary reports but remain in the database.)

For the years 1991 to 1998, we determined whether or not a use rate was an outlier based on the distribution of rates for all applications on each crop and pesticide during the year of its application. For the 1999 PUR we determined outliers in two stages. In the first stage, outliers were identified as data that came to DPR from the counties during the year but based on the distribution of rates from the previous year. This procedure allowed us to include outliers in the error reports sent back to the counties. In the second stage, the outlier program was run after all 1999 data were received using the distribution of rates for 1999. This procedure found additional outliers for new products and new uses. For the 2002 PUR, the data was processed in the same manner.

Beginning with the 1999 PUR data, values have been substituted where outliers were identified in the first phase. Nulls were substituted in numeric fields identified as outliers, and “???” were substituted in character fields identified as outliers. A median rate value for use on a commodity/product combination was substituted where a high rate per acre was the error. In addition, “Unknown” was substituted where the reported site code was invalid.

III. DATA SUMMARY

This report is a summary of data submitted to DPR. Total pounds may change slightly due to ongoing error correction. The revised numbers will more accurately reflect the total pounds applied.

PESTICIDE USE IN CALIFORNIA

In 2003, there were 175,127,171 pounds of pesticide active ingredients reported used in California. Annual use has varied since full use reporting was implemented in 1990. Reported pesticide use was 168 million pounds in 2002, 153 million pounds in 2001 (not all of Kern County PUR data was available), 188 million pounds in 2000, 202 million pounds in 1999, 214 million pounds in 1998, and 205 million pounds in 1997.

Such variances are and will continue to be a normal occurrence. These fluctuations can be attributed to a variety of factors, including changes in planted acreage, crop plantings, pest pressures, and weather conditions. For example, extremely heavy rains result in excessive weeds, thus more pesticides may be used; drought conditions may result in fewer planted acres, thus less pesticide may be used.

As in previous years, the greatest pesticide use occurred in California's San Joaquin Valley (Table 1). Four counties in this region had the highest use: Fresno, Kern, Tulare, and San Joaquin.

Table 2 breaks down the pounds of pesticide use by general use categories: production agriculture, post-harvest commodity fumigation, structural pest control, landscape maintenance, and all others.

PESTICIDE SALES IN CALIFORNIA

Reported pesticide applications are only a portion of the pesticides sold each year. Typically, about two-thirds of the pesticide active ingredients reported sold in a given year are not subject to use reporting. Examples of non-reported active ingredients are chlorine (used primarily for municipal water treatment) and home-use pesticide products.

The preliminary figure for 2003 is approximately 570 million pounds of pesticide active ingredients sold in California, 598 million pounds in 2002, 563 million pounds in 2001, 601 million pounds in 2000, 707 million pounds in 1999, 617 million pounds in 1998, and 645 million pounds in 1997. Prior years data are posted on DPR's web site at www.cdpr.ca.gov. (Click "Programs & Services", "Mill Assessment", "Report of Pesticides Sold in CA.)

As a result of increased surveillance/monitoring at retail locations during 2003, DPR has determined that many non-agricultural pesticide products are being sold in California, however these sales are not being reported. DPR has stepped up inspections and enforcement in 2004.

In addition, it should be noted that the pounds of pesticides used and the number of applications are not necessarily accurate indicators of the extent of pesticide use or, conversely, the extent of use of reduced-risk pest management methods. For example, farmers may make a number of small-scale "spot" applications targeted at problem areas rather than one treatment of a large area. They may replace a more toxic pesticide used at one pound per acre with a less hazardous compound that must be applied at several pounds per acre. Either of these scenarios could increase the number of applications and amount of pounds used without indicating an increased reliance on pesticides.

Table 1. Total pounds of pesticide active ingredients reported in each county during 2002 and 2003 and its rank among all 58 counties.

	2002 Pesticide Use		2003 Pesticide Use	
County	**Pounds Applied**	**Rank**	**Pounds Applied**	**Rank**
Alameda	318,304	38	444,850	37
Alpine	254	58	184	58
Amador	100,665	44	101,889	45
Butte	2,856,927	18	3,062,292	17
Calaveras	66,050	48	57,827	49
Colusa	1,805,698	23	2,088,248	22
Contra Costa	580,309	35	991,115	30
Del Norte	373,144	37	371,176	38
El Dorado	96,844	45	103,487	44
Fresno	27,902,384	1	27,256,367	1
Glenn	2,202,642	20	2,284,461	21
Humboldt	38,364	50	106,514	43
Imperial	6,208,528	9	6,809,038	8
Inyo	9,700	53	51,129	50
Kern	22,029,291	2	22,905,081	2
Kings	5,435,060	10	5,233,435	11
Lake	842,738	31	786,874	32
Lassen	172,400	43	61,347	47
Los Angeles	3,534,197	13	4,070,598	12
Madera	9,028,459	5	8,614,993	6
Marin	73,442	47	59,156	48
Mariposa	5,510	56	16,185	53
Mendocino	1,424,069	28	1,475,689	27
Merced	6,832,514	7	6,839,552	7
Modoc	190,727	42	232,839	42
Mono	1,830	57	24,729	52
Monterey	7,816,905	6	9,329,416	5
Napa	2,092,926	21	1,934,856	24
Nevada	59,289	49	42,098	51
Orange	1,699,933	24	1,669,090	25
Placer	308,121	39	267,931	41
Plumas	31,582	51	14,447	54
Riverside	3,247,719	16	3,340,585	14
Sacramento	3,975,151	12	3,583,177	13
San Benito	672,432	33	743,723	34
San Bernardino	466,296	36	517,631	36
San Diego	1,999,610	22	2,491,139	20
San Francisco	20,870	52	12,085	55
San Joaquin	9,402,936	4	10,203,204	4
San Luis Obispo	1,669,364	25	2,032,697	23
San Mateo	223,193	41	273,273	40

Table 1 (continued) Total pounds of pesticide active ingredients reported in each county during 2002 and 2003 and its rank among all 58 counties.

	2002 Pesticide Use		2003 Pesticide Use	
County	**Pounds Applied**	**Rank**	**Pounds Applied**	**Rank**
Santa Barbara	3,307,718	15	3,331,881	15
Santa Clara	659,457	34	978,008	31
Santa Cruz	1,526,084	26	1,643,653	26
Shasta	299,529	40	293,445	39
Sierra	7,442	55	4,812	57
Siskiyou	879,410	30	750,180	33
Solano	1,234,447	29	1,089,607	29
Sonoma	2,965,045	17	2,892,958	18
Stanislaus	4,594,347	11	5,573,755	10
Sutter	3,519,255	14	3,305,776	16
Tehama	795,587	32	659,978	35
Trinity	7,505	54	6,917	56
Tulare	12,264,042	3	13,303,523	3
Tuolumne	73,549	46	72,189	46
Ventura	6,329,662	8	6,644,422	9
Yolo	2,228,001	19	2,644,303	19
Yuba	1,432,641	27	1,427,355	28
	***167,940,097**		**175,127,171**	

* Total pounds have been corrected and revised.

Table 2. Pounds of pesticide active ingredients, 1994 – 2003, by general use categories.

Year	Production Agriculture	Postharvest Fumigation	Structural Pest Control	Landscape Maintenance	All Others*	Total Pounds
1994	175,408,663	2,004,123	5,186,253	1,325,560	7,430,770	191,355,369
1995	187,577,922	3,770,169	4,839,368	1,382,563	7,563,928	205,133,950
1996	182,375,369	1,847,859	4,738,168	1,259,332	7,607,752	197,828,481
1997	189,796,122	1,608,996	5,184,905	1,231,788	6,957,905	204,779,717
1998	198,568,999	1,655,875	5,930,988	1,405,312	6,783,731	214,344,905
1999	185,457,062	2,019,542	5,673,321	1,403,635	7,858,041	202,411,602
**2000	172,730,676	2,143,396	5,165,189	1,395,598	6,728,174	188,163,033
**2001	138,842,868	1,446,359	4,923,647	1,290,542	6,214,977	152,718,393
**2002	152,506,562	1,847,353	5,467,116	1,439,532	6,679,534	167,940,097
2003	158,729,003	1,821,455	5,143,281	1,946,478	7,486,954	175,127,171

* This category includes pesticide applications reported in the following general categories: pest control on rights-of-way; public health which includes mosquito abatement work; vertebrate pest control; fumigation of nonfood and nonfeed materials such as lumber, furniture, etc.; pesticide used in research; and regulatory pest control used in ongoing control and/eradication of pest infestations.

** Total pounds have been corrected and revised.

IV. TRENDS IN USE IN CERTAIN PESTICIDE CATEGORIES

Reported pesticide use in California in 2003 totaled 175 million pounds, an increase of 7.2 million pounds from 2002. Production agriculture, the major category of use subject to reporting requirements, accounted for most of the overall increase in use. Applications for production agriculture increased by 6.2 million pounds.

The active ingredients with the largest uses by pounds were sulfur, petroleum oils, metam-sodium, and methyl bromide. Sulfur use decreased by 46,000 pounds (-0.1 percent) but was still the most highly used pesticide in 2003, both in pounds applied and acres treated. By pounds, sulfur accounted for 30 percent of all reported pesticide use. Sulfur is a natural fungicide favored by both conventional and organic farmers. Petroleum oil use decreased by 209,000 pounds (-1 percent), metam sodium use decreased by 322,000 pounds (-2 percent), and methyl bromide use increased by 834,000 million pounds (13 percent).

Major crops or sites that showed an overall increase in pesticide pounds applied from 2002 to 2003 included almonds (1.4 million pounds increase), strawberries (1.0 million pounds), carrots (0.8 million pounds), rights-of-way (0.6 million pounds), and rice (0.5 million pounds). Major crops or sites with decreased pounds applied included wine grapes (0.6 million pounds), table and raisin grapes (0.6 million pounds), structural pest control (0.3 million pounds), potatoes (0.3 million pounds), and lemons (0.2 million pounds).

DPR data analyses have shown that pesticide use varies from year to year depending upon pest problems, weather, acreage and types of crops planted, economics, and other factors. For most of the 12 crops investigated, pest problems, especially diseases, were higher in 2003 than in 2002 in several areas due to the wet and cool spring in 2003. Prices for most of the 12 crops improved in 2003, which may have also been an incentive to use more pesticides to protect valuable crops. However, acreage of most of the 12 crops decreased.

Pesticide use is reported as the number of pounds of active ingredient and the total number of acres treated. The data for pounds include both agricultural and nonagricultural applications; the data for acres treated are primarily agricultural applications. The number of acres treated means the cumulative number of acres treated; the acres treated in each application are summed even when the same field is sprayed more than once in a year. (For example, if one acre is treated three times in a season with an individual active ingredient, it is counted as three acres treated in the tables and graphs in Sections IV and V of this report.)

Use increased in most pesticide categories. Most of the increase in pounds applied was due to increases in mineral oil and the fumigants methyl bromide and 1,3-dichloropropene. (Fumigants are applied at high rates, in part, because they treat a volume of space rather than a surface area such as the leaves and stems of plants. Thus, the pounds applied are large even though the number of applications or number of acres treated may be relatively small.) Some of the major statistical changes from 2002 to 2003 include:

- Chemicals classified as reproductive toxins increased in pounds applied from 2002 to 2003 (up 480,000 pounds or 2.0 percent) and increased slightly in cumulative acres treated (up 22,000 acres or 0.9 percent). The increase in pounds was due mostly to the fumigant methyl bromide. Most of this increase can be attributed to treatment on newly planted and replanted almond acres in Kern County.

- A similar pattern appeared for chemicals classified as carcinogens. Use of these chemicals increased in overall pounds applied (up 1.9 million pounds or 7.4 percent) and in cumulative acres treated (up 390,000 acres or 11 percent). The increase in pounds was mainly due to increase in uses of the fumigant 1,3-dichloropropene but the increase in acres treated was due mainly to the fungicides maneb, iprodione, mancozeb, and captan.

- Use of insecticide organophosphate and carbamate chemicals, which includes compounds of high regulatory concern, continued to decline by pounds, decreasing by 680,000 pounds (7.9 percent) although acres treated was nearly the same, down only 3,000 acres (0.05 percent). Use of chlorpyrifos increased; the largest decreases in use were molinate, thiobencarb, and diazinon.

- Use of chemicals categorized as ground water contaminants was nearly the same in 2003 as in 2002. Use by pounds increased 38,000 pounds applied (1.7 percent), but cumulative acres treated decreased by about 5,000 acres (0.3 percent). Most of the increase in pounds was due to diuron and simazine.

- Chemicals categorized as toxic air contaminants, another regulatory concern, increased by 2.6 million pounds applied (7.9 percent). Cumulative acres treated increased by about 367,000 acres (12 percent). Most of the increase in pounds was due to increases in methyl bromide and 1,3-dichloropropene; most of the increase in acres was due to maneb and 2,4-D.

- Use of reduced-risk pesticides increased considerably, by 311,000 pounds applied (41 percent) and by 1.8 million acres treated (47 percent). The biggest increase was in use of the insecticide indoxacarb.

- Biopesticide use decreased by 81,000 pounds (7.2 percent) but increased by 174,000 acres treated (8.1 percent). Use of the biopesticides potassium bicarbonate, GABA, and *Bacillus thuringiensis* increased; the decrease in pounds was due mostly to a decrease in use of liquefied nitrogen.

Since 1994, the reported pounds of pesticides applied have fluctuated from year to year with no general increasing or decreasing trend. An increase or decrease in use from one year to the next or in the span of a few years does not necessarily indicate a general trend in use; it simply may reflect normal variations. Short periods of time (three to five years) may suggest trends, such as the increased pesticide use from 1994 to 1998 or the decreased use from 1998 to 2001. However, statistical analyses from 1994 to 2003 do not indicate a significant trend of either increase or decrease in pesticide use.

To improve data quality when calculating the total pounds of pesticides, DPR excluded values that were so large they were probably in error. The procedure to exclude probable errors involved the development of complex error-checking algorithms, a data improvement process that is ongoing.

Over-reporting errors have a much greater impact on the numerical accuracy of the database than under-reporting errors. For example, if a field is treated with 100 pounds of a pesticide active ingredient and the application is erroneously recorded as 100,000 pounds (a decimal point shift of three places to the right), an error of 99,900 pounds is introduced into the database. If the same degree of error is made in shifting the decimal point to the left, the application is recorded as 0.1 pound, and an error of 99.9 pounds is entered into the database

To provide an overview, pesticide use is summarized for eight different categories from 1993 to 2003 (Tables 3–10 and Figures 1–8). These categories classify pesticides according to certain characteristics such as reproductive toxins, carcinogens, or reduced-risk characteristics.

The statistical summaries detailed in these categories are not intended to serve as indicators of pesticide risks to the public or the environment. Rather, the data supports DPR regulatory functions to enhance public safety and environmental protection. (See “How Pesticide Data are Used” on page iv.) The different pesticide categories, described more fully, are:

1. Pesticides listed on the State's Proposition 65 list of chemicals "known to cause reproductive toxicity."
2. Pesticides listed by U.S. EPA as B2 carcinogens or on the State's Proposition 65 list of chemicals "known to cause cancer."
3. Pesticides that are cholinesterase inhibitors, that is, organophosphate and carbamate chemicals.
4. Pesticides on DPR's groundwater protection list (section 6800 (a) of the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1) and norflurazon, which DPR is recommending be listed as a restricted material.
5. Pesticides from DPR's toxic air contaminants list (California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1, section 6860).
6. Oil pesticides, which may include some chemicals on the State’s Proposition 65 list of chemicals “known to cause cancer” but which also serve as alternatives to high-toxicity pesticides.
7. Active ingredients contained in pesticide products that have been given reduced-risk status by U.S. EPA.
8. Biopesticides, which include microorganisms and naturally occurring compounds, or compounds essentially identical to naturally occurring compounds that are not toxic to the target pest (such as pheromones).

USE TRENDS OF PESTICIDES ON THE STATE'S PROPOSITION 65 LIST OF CHEMICALS THAT ARE "KNOWN TO CAUSE REPRODUCTIVE TOXICITY"

Table 3A. The reported **pounds** of pesticides used which are on the State's Proposition 65 list of chemicals that are "known to cause reproductive toxicity." Use includes both agricultural and reportable nonagricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1080	<1	<1	1	<1	<1	<1	<1	<1	<1	<1
2,4-DB ACID	0	0	0	1,697	6,932	12,397	11,453	16,954	9,393	6,408
AMITRAZ	70,363	75,018	55,459	66,439	13,563	7,558	8,087	263	154	115
ARSENIC PENTOXIDE	86,445	83,814	205,089	64,372	50,899	245,238	91,267	259,386	194,650	165,709
ARSENIC TRIOXIDE	<1	<1	<1	<1	1	1	<1	<1	<1	<1
BENOMYL	141,586	189,943	148,433	114,406	227,690	133,109	118,601	76,739	28,978	7,094
BROMACIL, LITHIUM SALT	11,085	6,517	17,381	9,141	4,686	4,162	4,478	3,217	4,016	3,025
BROMOXYNIL OCTANOATE	127,154	119,407	148,480	115,368	120,877	120,338	116,125	78,484	72,759	76,927
CHLORSULFURON	1,228	1,485	1,623	2,218	3,046	1,445	2,590	1,203	2,190	8,690
CYANAZINE	532,688	641,057	566,632	470,838	277,313	180,487	50,468	17,250	7,178	37
CYCLOATE	51,035	49,138	44,628	55,459	62,753	49,096	37,408	31,785	34,347	30,080
DICLOFOP-METHYL	38,276	16,540	79,874	41,130	24,783	18,710	21,696	11,765	5,058	9,309
EPTC	765,576	660,185	703,996	579,245	393,031	448,883	323,254	276,782	253,887	141,756
ETHYLENE OXIDE	3	0	0	0	31	2	6	3	0	0
FENOXAPROP ETHYL	5,023	3,731	3,974	3,895	1,504	2,048	979	366	106	53
FLUAZIFOP-BUTYL	19,772	20,451	15,095	15,253	14,724	14,376	205	149	166	31
FLUAZIFOP-P-BUTYL	0	0	0	0	0	0	11,595	9,489	9,984	8,759
HYDRAMETHYLNON	227	807	1,741	5,456	3,183	2,267	2,495	2,381	2,741	2,024
LINURON	79,950	84,937	84,335	84,621	82,170	78,046	65,511	58,173	61,994	60,128
METAM-SODIUM	11,122,361	14,975,528	15,253,924	14,969,732	13,729,306	16,774,246	13,218,764	12,545,403	15,137,719	14,815,687
METHYL BROMIDE	16,607,324	17,165,964	16,022,069	15,663,832	13,569,875	15,300,388	10,869,241	6,618,631	6,550,818	7,384,398
METIRAM	0	0	0	0	<1	0	0	2	0	1
MYCLOBUTANIL	69,941	85,525	89,087	94,375	129,773	94,626	96,175	83,995	76,655	83,465
NABAM	8	1	0	0	50	2	1	8	0	0
NICOTINE	457	228	298	258	83	93	21	17	2	2
NITRAPYRIN	150	639	114	49	407	150	192	16	89	117
OXADIAZON	20,488	21,458	25,260	23,196	21,959	19,399	18,256	15,905	16,692	12,550
OXYDEMETON-METHYL	111,347	120,101	106,612	115,781	89,789	122,912	110,797	99,756	96,357	93,789
OXYTHIOQUINOX	4,474	7,172	6,204	2,709	1,576	2,705	411	149	117	34
POTASSIUM DIMETHYL DITHIO CARBAMATE	47	0	0	15	24,795	0	0	0	23	28
PROPARGITE	1,742,736	1,770,065	1,743,278	1,816,028	1,385,327	1,504,268	1,331,979	1,159,792	972,371	1,054,607

Table 3A (continued). The reported **pounds** of pesticides used which are on the State's Proposition 65 list of chemicals that are "known to cause reproductive toxicity."

Active Ingredient	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
RESMETHRIN	1,069	856	661	594	796	632	712	542	661	1,561
SODIUM DIMETHYL DITHIO CARBAMATE	337	1	0	0	8,279	355	1,315	173	0	0
STREPTOMYCIN SULFATE	6,165	9,619	9,494	9,605	14,950	9,406	10,820	7,554	5,990	8,588
TAU-FLUVALINATE	4,723	3,787	4,137	3,040	2,827	3,315	2,251	2,228	2,184	1,630
THIOPHANATE-METHYL	100,890	116,746	122,862	88,640	65,169	76,040	67,779	66,953	71,468	125,925
TRIADIMEFON	24,147	20,692	17,370	12,204	12,919	4,846	3,114	2,840	1,736	1,770
TRIBUTYLTIN METHACRYLATE	1,734	278	185	60	113	270	107	106	39	0
TRIFORINE	32,574	39,729	24,877	6,562	2,752	519	365	99	78	88
VINCLOZOLIN	33,661	48,270	60,286	46,908	54,719	52,731	35,658	32,208	22,164	18,568
WARFARIN	<1	<1	1	1	1	1	1	1	1	3
Grand Total	31,815,043	36,339,689	35,563,459	34,483,130	30,402,653	35,285,066	26,634,181	21,480,765	23,642,762	24,122,956

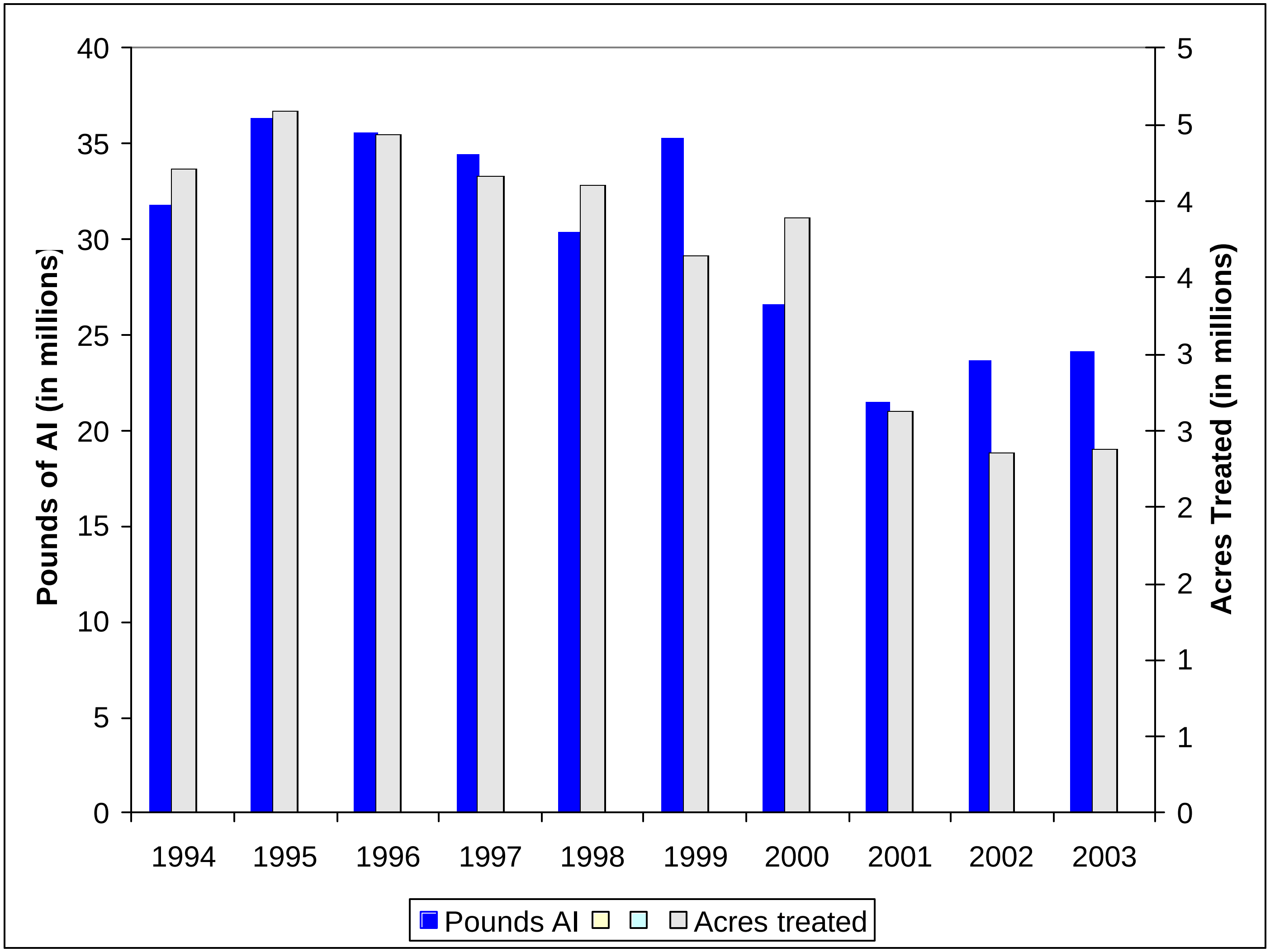
Table 3B. The reported **cumulative acres treated** with pesticides that are on the State's Proposition 65 list of chemicals "known to cause reproductive toxicity." Use includes primarily agricultural applications. The grand total for acres treated may be less than the sum of acres treated for all active ingredients because some products contain more than one active ingredient. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1080	53	32	25	0	0	0	42	30	301	50
2,4-DB ACID	0	0	0	2,599	12,167	20,063	19,496	25,843	15,584	10,384
AMITRAZ	137,434	174,867	129,857	161,651	28,945	14,684	16,011	1,269	605	379
ARSENIC PENTOXIDE	660	0	0	0	0	0	709,893	56	0	0
ARSENIC TRIOXIDE	0	0	0	0	0	0	0	0	1	<1
BENOMYL	271,289	360,931	310,563	245,687	434,725	242,796	217,611	135,929	47,771	13,360
BROMACIL, LITHIUM SALT	0	0	0	0	40	40	30	0	0	0
BROMOXYNIL OCTANOATE	245,715	224,276	277,062	224,250	240,997	257,417	313,362	251,527	238,713	218,285
CHLORSULFURON	39,962	39,584	54,360	27,628	39,873	30,691	34,528	29,079	18,836	25,830
CYANAZINE	284,812	365,520	325,627	288,087	185,082	129,547	56,059	19,708	8,763	25
CYCLOATE	22,571	20,685	19,597	25,986	29,761	24,555	18,487	15,918	17,213	16,721
DICLOFOP-METHYL	47,273	19,314	89,276	47,217	28,296	21,442	24,470	14,198	6,259	11,257
EPTC	273,441	241,587	232,820	208,093	141,511	148,685	107,613	99,953	94,240	56,639
ETHYLENE OXIDE	0	0	0	0	194	31	41	0	0	0
FENOXAPROP ETHYL	33,712	24,153	25,540	24,439	10,480	13,824	8,847	3,820	1,327	839
FLUAZIFOP-BUTYL	90,378	80,726	58,367	54,192	55,734	51,114	137	144	98	0
FLUAZIFOP-P-BUTYL	0	0	0	0	0	0	41,780	34,283	40,966	28,325
HYDRAMETHYLNON	0	3	36	35	289	1,615	3,648	2,762	2,148	1,978
LINURON	97,887	105,284	104,772	110,067	112,122	111,009	86,317	81,801	86,914	85,427
METAM-SODIUM	183,625	199,457	215,899	198,395	154,309	186,300	146,847	125,263	141,357	142,396
METHYL BROMIDE	106,694	107,933	96,507	103,068	90,107	102,125	75,741	60,892	53,100	55,251
METIRAM	0	0	0	0	<1	0	0	7	0	<1
MYCLOBUTANIL	692,036	841,178	814,268	866,360	1,225,372	887,981	842,639	737,643	704,231	741,930
NABAM	0	0	0	0	55	20	0	60	0	0
NICOTINE	382	237	167	128	57	36	14	31	1	0
NITRAPYRIN	261	1,493	147	105	851	329	276	0	169	258
OXADIAZON	1,812	2,400	2,213	1,832	1,933	3,407	2,656	2,637	1,838	1,904
OXYDEMETON-METHYL	226,433	253,868	220,824	244,056	186,964	253,281	225,984	200,171	193,441	189,047
OXYTHIOQUINOX	6,410	10,000	8,768	5,896	5,306	2,152	817	250	182	71
POTASSIUM DIMETHYL DITHIO CARBAMATE	6	0	0	0	0	0	0	0	2	6
PROPARGITE	1,030,485	1,052,358	980,963	989,265	756,098	795,410	704,529	606,737	524,421	558,006

Table 3B (continued). The reported **cumulative acres treated** with pesticides that are on the State's Proposition 65 list of chemicals "known to cause reproductive toxicity."

Active Ingredient	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
RESMETHRIN	419	222	144	182	160	84,044	33	35	32	66
SODIUM DIMETHYL DITHIO CARBAMATE	0	0	0	0	253	20	0	60	0	0
STREPTOMYCIN SULFATE	58,703	84,111	84,999	89,336	131,936	76,414	97,019	62,184	52,180	63,444
TAU-FLUVALINATE	26,578	19,771	22,156	18,387	14,075	17,343	10,101	10,893	9,024	7,937
THIOPHANATE-METHYL	86,803	101,694	128,267	89,556	63,842	81,428	68,422	53,990	64,324	121,294
TRIADIMEFON	132,295	118,746	100,142	59,229	79,968	25,719	11,855	9,501	6,747	7,625
TRIBUTYLTIN METHACRYLATE	13	<1	1	<1	1	1	1	<1	0	0
TRIFORINE	64,069	76,411	53,589	17,455	6,352	1,279	751	244	203	196
VINCLOZOLIN	49,519	66,672	82,968	67,373	69,067	63,931	43,629	38,570	27,786	21,682
WARFARIN	192	151	541	382	310	99	556	101	449	632
Grand Total	4,211,923	4,593,665	4,440,467	4,170,939	4,107,177	3,648,813	3,890,242	2,625,528	2,359,227	2,381,245

Figure 1. Use trends of pesticides that are on the State's Proposition 65 list of chemicals that are "known to cause reproductive toxicity." Reported pounds of active ingredient (AI) applied includes both agricultural and nonagricultural applications. The reported cumulative acres treated includes primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.



USE TRENDS OF PESTICIDES LISTED BY U.S. EPA AS CARCINOGENS OR BY THE STATE AS "KNOWN TO CAUSE CANCER"

Table 4A. The reported **pounds** of pesticides used that are listed by U.S. EPA as B2 carcinogens or that are on the State's Proposition 65 list of chemicals "known to cause cancer." Use includes both agricultural and reportable nonagricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1,3-DICHLOROPROPENE	2,122	409,821	1,956,846	2,400,930	2,911,385	3,122,723	4,442,193	4,135,462	5,359,193	7,009,034
ACIFLUORFEN, SODIUM SALT	1	6	11	29	<1	10	<1	1	3	<1
ALACHLOR	42,854	41,119	45,733	51,259	46,264	29,789	36,468	29,431	28,666	24,913
ARSENIC ACID	27,571	37,206	53,777	59,835	52,558	48,029	11,906	12,023	4,976	318
ARSENIC PENTOXIDE	86,445	83,814	205,089	64,372	50,899	245,238	91,267	259,386	194,650	165,709
ARSENIC TRIOXIDE	<1	<1	<1	<1	1	1	<1	<1	<1	<1
CACODYLIC ACID	43,685	43,275	31,417	26,060	17,379	15,930	16,093	3,983	1,795	207
CAPTAN	608,658	734,314	918,588	799,878	1,559,136	965,922	642,757	399,263	392,205	499,973
CHLOROTHALONIL	832,288	1,125,790	1,053,319	779,328	1,181,163	753,840	680,735	522,212	605,016	712,761
CHROMIC ACID	120,822	117,092	286,521	89,931	71,109	343,543	128,642	363,205	272,300	232,064
CREOSOTE	871,469	444,461	491,044	259,086	1,752	4,873	9,879	4,700	9,018	3,384
DAMINOZIDE	6,775	6,763	7,944	11,028	10,306	9,411	9,138	11,323	10,048	10,156
DDVP	4,798	6,063	13,097	13,636	13,998	12,325	12,718	12,837	8,524	3,437
DIOCTYL PHTHALATE	83	<1	1	1	318	1,076	595	640	604	521
DIPROPYL ISOCINCHOMERONATE	2	1	3	<1	<1	0	<1	1	0	1
DIURON	1,234,507	1,054,409	1,265,426	1,228,114	1,504,268	1,188,640	1,343,727	1,107,421	1,303,108	1,343,596
ETHOPROP	51,270	51,104	27,955	23,842	27,949	26,196	16,119	19,046	16,531	28,419
ETHYLENE OXIDE	3	0	0	0	31	2	6	3	0	0
FENOXYCARB	1,492	1,673	712	65	552	71	88	86	53	32
FOLPET	3	2	<1	<1	<1	<1	<1	0	2	<1
FORMALDEHYDE	11,864	153,519	334,548	403,824	305,297	111,714	55,300	28,612	14,035	18,690
IPRODIONE	431,318	564,127	520,763	424,338	572,287	411,548	422,179	305,629	247,365	287,631
LINDANE	5,281	4,507	4,576	5,388	6,293	4,842	4,738	2,388	1,633	908
MANCOZEB	464,924	659,240	567,866	526,364	987,270	630,968	611,498	430,604	396,672	538,033
MANEB	912,903	1,257,122	1,328,318	1,081,124	1,596,876	1,045,567	1,203,483	817,059	851,643	1,026,685
METAM-SODIUM	11,122,361	14,975,528	15,253,924	14,969,732	13,729,306	16,774,246	13,218,764	12,545,403	15,137,719	14,815,687
METIRAM	0	0	0	0	<1	0	0	2	0	1
ORTHO-PHENYLPHENOL	11,027	14,892	10,349	15,962	11,248	8,600	8,516	4,016	15,205	5,141
ORTHO-PHENYLPHENOL, SODIUM SALT	46,825	30,830	33,539	25,389	32,315	29,019	31,681	27,071	25,249	20,857
OXADIAZON	20,488	21,458	25,260	23,196	21,959	19,399	18,256	15,905	16,692	12,550
OXYTHIOQUINOX	4,474	7,172	6,204	2,709	1,576	2,705	411	149	117	34

Table 4A (continued). The reported **pounds** of pesticides used that are listed by U.S. EPA as B2 carcinogens or that are on the State's Proposition 65 list of chemicals "known to cause cancer."

Active Ingredient	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
PARA-DICHLOROBENZENE	3	2	4	3	219	86	4	11	1	25
PENTACHLOROPHENOL	40	3	3	8	33	92	466	14	17	3
POTASSIUM DICHROMATE	596	380	41	50	103	319	554	1	<1	11
PROPARGITE	1,742,736	1,770,065	1,743,278	1,816,028	1,385,327	1,504,268	1,331,979	1,159,792	972,371	1,054,607
PROPOXUR	2,667	3,296	1,341	1,760	1,604	1,735	2,141	611	449	304
PROPYLENE OXIDE	41,815	131,593	224,495	198,559	198,595	172,556	118,381	99,727	99,674	99,396
PROPYZAMIDE	111,797	113,761	106,811	99,292	104,292	104,484	103,705	108,987	107,531	104,375
SODIUM DICHROMATE	0	0	180,478	182,185	122,647	32,699	122	329	633	217
THIODICARB	0	13,679	122,927	156,002	114,785	60,453	36,844	9,360	5,194	8,392
VINCLOZOLIN	33,661	48,270	60,286	46,908	54,719	52,731	35,658	32,208	22,164	18,568
Grand Total	18,899,632	23,926,358	26,882,493	25,786,216	26,695,819	27,735,648	24,647,014	22,468,903	26,121,055	28,046,644

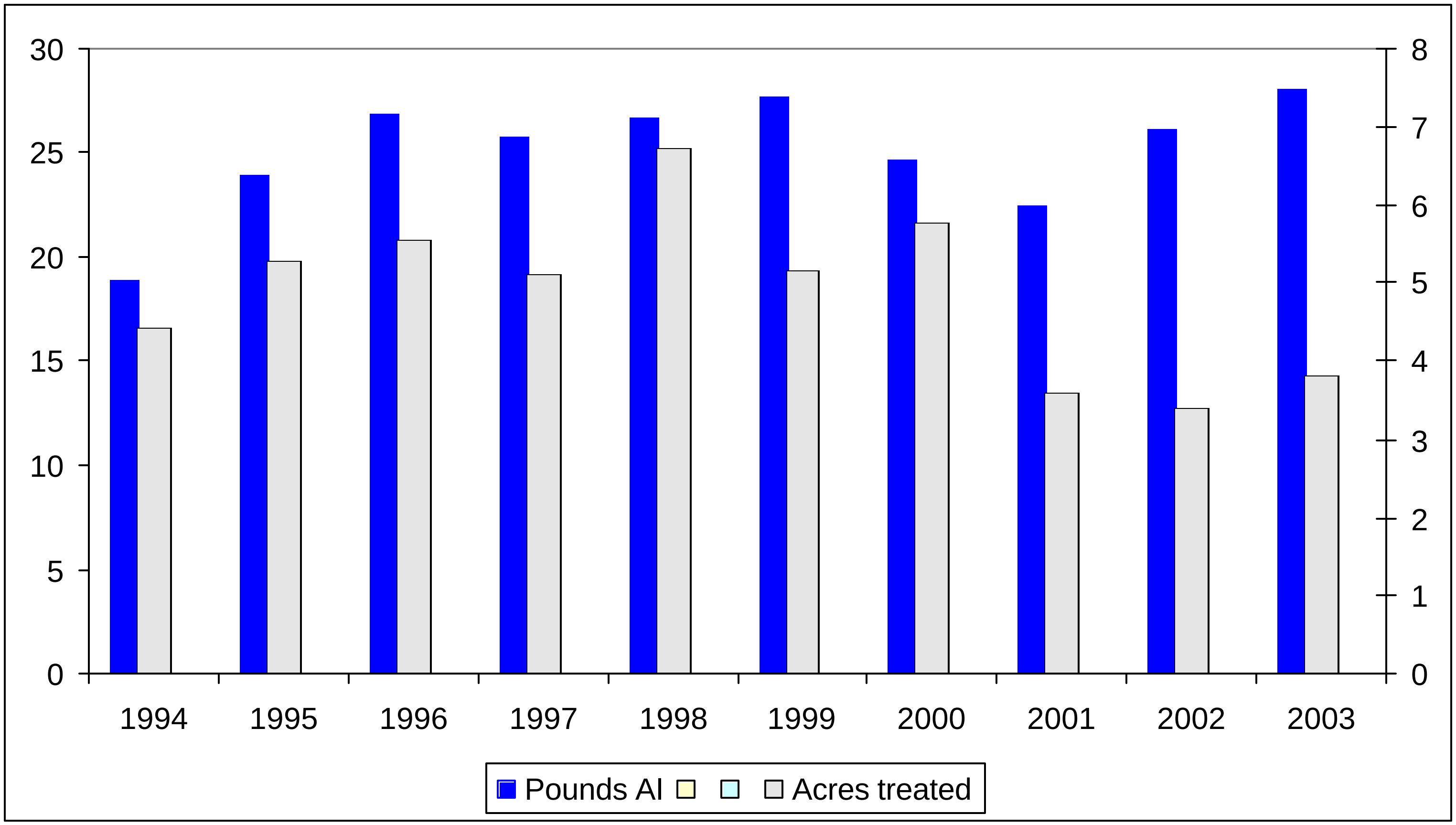
Table 4B. The reported **cumulative acres treated** with pesticides listed by U.S. EPA as B2 carcinogens or on the State's Proposition 65 list of chemicals "known to cause cancer." Use includes primarily agricultural applications. The grand total for acres treated is less than the sum of acres treated for all active ingredients because some products contain more than one active ingredient. Data are from the Department of Pesticide Regulation's Pesticide Use.

Active Ingredient	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
1,3-DICHLOROPROPENE	33	4,174	17,223	22,193	27,059	29,430	33,101	30,817	42,064	48,944
ACIFLUORFEN, SODIUM SALT	2	8	<1	0	0	0	0	0	11	0
ALACHLOR	16,135	15,359	18,181	19,059	16,430	11,008	13,302	11,453	14,467	10,004
ARSENIC ACID	0	0	0	0	0	0	0	0	0	0
ARSENIC PENTOXIDE	660	0	0	0	0	0	709,893	56	0	0
ARSENIC TRIOXIDE	0	0	0	0	0	0	0	0	1	<1
CACODYLIC ACID	304,060	315,336	251,414	192,816	126,912	111,607	117,656	31,283	12,648	757
CAPTAN	244,164	295,860	381,989	347,631	602,684	404,731	309,768	215,969	213,438	271,140
CHLOROTHALONIL	517,357	674,126	674,086	492,219	796,672	456,007	428,109	312,726	347,725	361,250
CHROMIC ACID	660	0	0	0	0	0	709,893	56	0	0
CREOSOTE	0	0	0	0	126	11	45	1	0	0
DAMINOZIDE	2,692	2,659	2,653	3,512	4,510	3,107	3,416	6,146	5,319	3,103
DDVP	1,888	1,887	1,499	2,596	3,692	2,180	2,336	3,954	4,327	2,576
DIOCTYL PHTHALATE	1,060	0	55	14	6,250	24,270	11,195	10,776	6,649	3,880
DIPROPYL ISOCINCHOMERONATE	50	10	0	0	0	0	5	0	0	0
DIURON	454,829	507,279	685,352	819,993	865,246	849,482	864,334	788,559	796,903	843,154
ETHOPROP	5,767	5,470	3,139	3,213	3,784	3,610	3,477	3,542	4,152	6,078
ETHYLENE OXIDE	0	0	0	0	194	31	41	0	0	0
FENOXYCARB	5	11	5	<1	210	3,707	3,388	3,241	1,242	811
FOLPET	<1	0	1	2	0	0	0	0	0	0
FORMALDEHYDE	15	137	234	12	126	123	47	53	33	18
IPRODIONE	656,402	886,077	804,311	666,336	1,348,367	933,982	1,194,377	501,033	364,770	445,383
LINDANE	22,984	19,380	25,352	36,573	32,650	20,930	14,628	13,832	8,010	8,828
MANCOZEB	273,836	405,494	351,801	284,134	682,979	387,300	363,260	228,275	197,055	276,096
MANEB	512,009	652,122	731,079	624,123	942,083	629,897	611,717	535,105	554,787	659,893
METAM-SODIUM	183,625	199,457	215,899	198,395	154,309	186,300	146,847	125,263	141,357	142,396
METIRAM	0	0	0	0	<1	0	0	7	0	<1
ORTHO-PHENYLPHENOL	4	8	67	75	645	583	321	59	82	726
ORTHO-PHENYLPHENOL, SODIUM SALT	88	47	652	0	20	6,234	18,599	60	40	9
OXADIAZON	1,812	2,400	2,213	1,832	1,933	3,407	2,656	2,637	1,838	1,904
OXYTHIOQUINOX	6,410	10,000	8,768	5,896	5,306	2,152	817	250	182	71

Table 4B (continued). The reported **cumulative acres treated** with pesticides listed by U.S. EPA as B2 carcinogens or on the State's Proposition 65 list of chemicals "known to cause cancer".

Active Ingredient	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
PARA-DICHLOROBENZENE	0	0	0	0	10	0	0	0	0	0
PENTACHLOROPHENOL	2	<1	15	4	190	0	59	38	0	0
POTASSIUM DICHROMATE	0	0	0	0	40	71	40	0	20	0
PROPARGITE	1,030,485	1,052,358	980,963	989,265	756,098	795,410	704,529	606,737	524,421	558,006
PROPOXUR	14	5	9	73	45	39	26	4	23	1
PROPYLENE OXIDE	0	0	0	<1	0	573	0	0	<1	0
PROPYZAMIDE	157,829	155,773	150,791	140,791	144,864	142,194	137,337	145,325	140,680	132,819
SODIUM DICHROMATE	0	0	0	0	0	0	0	0	0	0
THIODICARB	0	22,785	176,788	223,154	155,440	83,796	50,604	13,382	8,256	12,113
VINCLOZOLIN	49,519	66,672	82,968	67,373	69,067	63,931	43,629	38,570	27,786	21,682
Grand Total	4,424,181	5,278,330	5,545,337	5,108,872	6,725,624	5,142,621	5,776,617	3,616,556	3,410,894	3,802,876

Figure 2. Use trends of pesticides that are listed by U.S. EPA as B2 carcinogens or that are on the State's Proposition 65 list of chemicals "known to cause cancer." Reported pounds of active ingredient (AI) applied includes both agricultural and reportable nonagricultural applications. The reported cumulative acres treated includes primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.



USE TRENDS OF CHOLINESTERASE-INHIBITING PESTICIDES

Table 5A. The reported **pounds** of cholinesterase-inhibiting pesticides used. These pesticides are the currently registered organophosphate and carbamate active ingredients. Use includes both agricultural and reportable nonagricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
3-IODO-2-PROPYNYL BUTYLCARBAMATE	0	0	<1	0	1	<1	<1	<1	0	0
ACEPHATE	371,862	458,012	355,350	343,840	384,091	307,272	283,355	240,191	217,383	223,749
ALDICARB	225,973	354,500	545,117	530,066	534,665	280,755	329,431	297,882	244,786	262,103
AZINPHOS-METHYL	418,935	406,230	406,099	336,353	193,069	216,624	185,055	159,786	153,200	213,863
BENDIOCARB	4,431	1,526	1,674	259	125	108	593	62	32	23
BENSULIDE	64,796	69,271	94,587	129,784	192,136	242,460	217,150	189,216	194,687	229,016
BUTYLATE	108,686	67,179	87,612	84,268	69,805	71,071	31,732	27,640	19,412	26,826
CARBARYL	820,787	835,811	809,794	753,801	426,893	387,145	365,174	287,802	256,057	205,080
CARBOFURAN	278,108	242,999	220,622	183,321	161,588	138,665	132,427	95,863	81,486	49,275
CHLORPROPHAM	3,000	3,230	3,015	2,057	2,321	3,102	3,544	3,504	1,380	6,191
CHLORPYRIFOS	2,887,838	3,385,416	2,687,809	3,152,564	2,355,626	2,257,936	2,093,400	1,674,120	1,419,332	1,546,481
COUMAPHOS	0	0	0	0	0	15	152	97	62	64
CYCLOATE	51,035	49,138	44,628	55,459	62,753	49,096	37,408	31,785	34,347	30,080
DDVP	4,798	6,063	13,097	13,636	13,998	12,325	12,718	12,837	8,524	3,437
DEMETON	1,238	775	411	0	3	5	2	3	42	<1
DESMEDIPHAM	8,588	8,465	6,092	6,188	4,737	6,014	6,703	3,750	3,398	3,636
DIAZINON	1,358,358	1,216,935	1,093,121	955,108	900,596	979,458	1,057,845	1,001,294	690,590	523,786
DICROTOPHOS	1	113	3	0	11	122	0	2	27	41
DIMETHOATE	671,948	583,498	419,807	515,798	397,847	485,274	397,223	284,751	310,422	294,928
DISULFOTON	134,600	95,972	142,372	128,335	105,327	95,919	76,164	51,545	54,567	46,996
EPTC	765,576	660,185	703,996	579,245	393,031	448,883	323,254	276,782	253,887	141,756
ETHEPHON	848,134	982,776	951,415	882,802	762,217	734,263	734,810	620,075	538,449	574,371
ETHION	4,054	79	2	3	906	64	0	5	13	13
ETHOPROP	51,270	51,104	27,955	23,842	27,949	26,196	16,119	19,046	16,531	28,419
FENAMIPHOS	178,781	187,242	189,379	156,280	125,459	107,745	104,505	74,858	70,939	59,421
FENTHION	186	413	141	176	29	22	33	61	79	3
FONOFOS	73,167	74,936	67,969	50,555	25,349	24,216	4,370	580	465	182
FORMETANATE HYDROCHLORIDE	152,622	104,012	106,168	97,907	77,723	65,030	43,941	45,625	35,844	28,420
MALATHION	749,317	801,496	673,379	773,782	645,889	678,105	505,970	556,371	636,384	654,151
METHAMIDOPHOS	240,959	500,055	260,255	312,067	244,269	116,256	76,865	46,615	30,645	36,987
METHIDATHION	367,447	321,605	328,328	309,154	178,451	177,105	98,129	93,521	68,389	54,398
METHIOCARB	4,126	2,672	2,120	4,769	5,384	3,314	2,411	2,262	1,852	2,274

Table 5A (continued). The reported **pounds** of cholinesterase inhibiting pesticides used.

Active Ingredient	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
METHOMYL	707,814	807,977	679,383	833,758	666,442	551,181	550,862	378,305	294,491	364,779
METHYL PARATHION	129,155	140,469	130,614	153,187	158,228	157,594	75,169	59,620	53,644	73,337
MOLINATE	1,496,227	1,377,257	1,356,258	1,170,699	1,006,025	911,376	1,025,786	733,534	877,572	539,871
NALED	457,723	700,676	351,267	615,314	260,048	297,895	255,419	261,882	196,777	186,260
OXAMYL	73,440	66,179	82,327	119,441	161,042	128,956	137,989	77,121	80,315	93,754
OXYDEMETON-METHYL	111,347	120,101	106,612	115,781	89,789	122,912	110,797	99,756	96,357	93,789
PARATHION	6,104	13,642	14,050	5,187	5,766	4,041	3,581	2,589	3,205	621
PEBULATE	235,690	244,181	202,634	184,015	185,696	225,077	160,018	45,619	71,721	35,755
PHENMEDIPHAM	8,863	8,771	6,612	6,621	5,836	6,735	7,478	4,249	4,351	5,021
PHORATE	159,146	135,887	160,854	139,725	149,707	93,488	87,974	70,645	76,482	64,947
PHOSALONE	99	52	27	33	11	0	4	0	0	0
PHOSMET	189,415	266,349	395,160	566,484	644,898	638,822	583,116	484,059	404,934	341,642
POTASSIUM DIMETHYL DITHIO CARBAMATE	47	0	0	15	24,795	0	0	0	23	28
PROFENOFOS	263,884	245,420	184,264	150,575	40,433	49,575	43,879	22,011	24,452	12,871
PROPAMOCARB HYDROCHLORIDE	0	0	16,341	10,215	57,121	6,285	4,959	2,288	828	83
PROPETAMPHOS	38,307	77,985	23,249	17,338	9,970	6,074	4,500	3,991	2,463	721
PROPOXUR	2,667	3,296	1,341	1,760	1,604	1,735	2,141	611	449	304
S,S,S-TRIBUTYL PHOSPHOROTRITHIOATE	892,441	866,726	760,809	626,684	440,382	345,842	396,827	257,062	190,149	233,640
SODIUM DIMETHYL DITHIO CARBAMATE	337	1	0	0	8,279	355	1,315	173	0	0
SULFOTEP	1,000	509	316	355	213	246	215	267	77	8
SULPROFOS	876	171	0	119	84	0	0	<1	0	0
TETRACHLORVINPHOS	10,051	7,118	7,056	6,044	5,831	3,975	4,850	4,746	3,285	1,262
THIOBENCARB	406,085	559,610	618,412	894,287	724,926	732,505	1,007,249	644,625	839,962	587,211
THIODICARB	0	13,679	122,927	156,002	114,785	60,453	36,844	9,360	5,194	8,392
TRICHLORFON	4,275	4,552	3,327	3,843	2,476	2,779	3,992	3,004	1,545	1,068
Grand Total	16,045,617	17,132,318	15,466,155	16,158,902	13,056,633	12,262,468	11,645,448	9,263,448	8,571,483	7,891,332

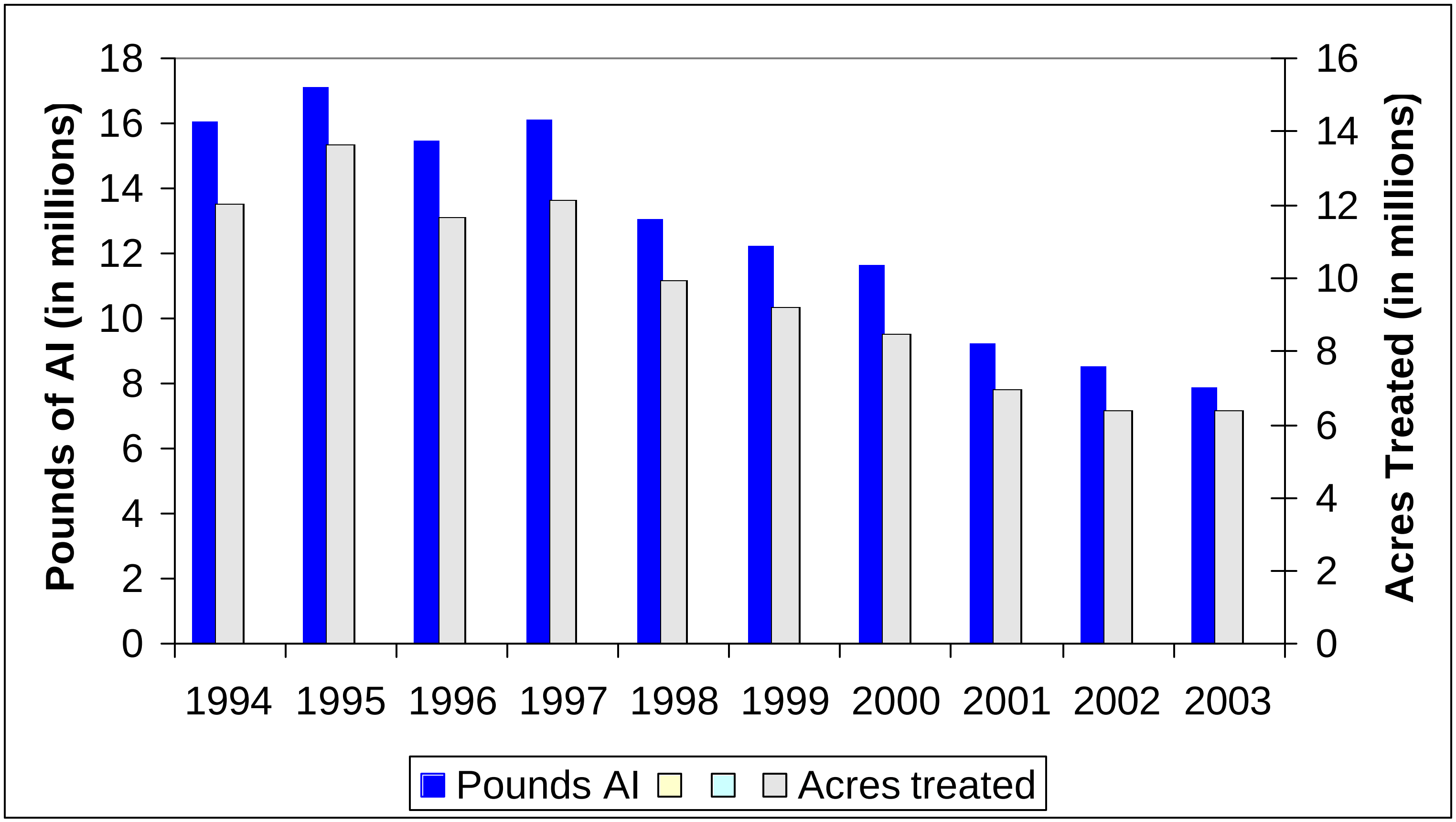
Table 5B. The reported **cumulative acres treated** with cholinesterase-inhibiting pesticides. These pesticides are the currently registered organophosphate and carbamate active ingredients. Use includes primarily agricultural applications. The grand total for acres treated is less than the sum of acres treated for all active ingredients because some products contain more than one active ingredient. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
3-IODO-2-PROPYNYL BUTYLCARBAMATE	0	0	0	0	150	0	0	40	0	0
ACEPHATE	402,643	489,259	406,607	372,566	403,537	370,111	295,298	266,278	232,908	223,396
ALDICARB	256,428	355,717	490,499	442,029	397,890	266,773	314,440	282,453	225,820	231,090
AZINPHOS-METHYL	293,466	274,347	277,745	233,406	134,334	140,226	118,805	117,544	94,035	117,001
BENDIOCARB	1,574	499	188	19	28	11	<1	2	0	9
BENSULIDE	17,446	22,489	31,916	45,795	61,984	80,873	72,866	62,859	60,883	66,375
BUTYLATE	23,105	14,864	17,689	17,572	14,259	14,959	6,957	6,270	4,598	5,450
CARBARYL	291,147	305,452	312,058	292,721	197,664	216,991	196,264	147,612	106,590	97,811
CARBOFURAN	460,647	449,507	364,150	322,064	303,957	272,441	258,441	246,149	182,567	91,791
CHLORPROPHAM	20	0	4	26	106	151	127	112	80	124
CHLORPYRIFOS	1,910,520	2,824,142	1,869,874	2,223,551	1,669,859	1,420,414	1,441,819	1,355,172	1,235,180	1,478,761
COUMAPHOS	0	0	0	0	0	0	1,339	809	733	17
CYCLOATE	22,571	20,685	19,597	25,986	29,761	24,555	18,487	15,918	17,213	16,721
DDVP	1,888	1,887	1,499	2,596	3,692	2,180	2,336	3,954	4,327	2,576
DEMETON	2,490	1,583	1,002	0	18	66	0	56	0	2
DESMEDIPHAM	62,171	71,577	51,183	61,368	56,272	71,977	60,248	34,738	32,344	35,435
DIAZINON	878,221	752,898	680,947	530,355	477,804	546,577	478,994	437,934	489,149	483,283
DICROTOPHOS	0	76	9	0	16	11	0	0	0	64
DIMETHOATE	1,205,884	1,193,214	955,445	1,097,751	871,305	1,078,024	874,730	639,271	681,318	621,038
DISULFOTON	114,949	87,291	147,078	124,319	100,935	86,332	69,018	45,258	48,723	39,182
EPTC	273,441	241,587	232,820	208,093	141,511	148,685	107,613	99,953	94,240	56,639
ETHEPHON	704,394	806,425	776,247	700,941	653,817	720,773	697,300	631,330	550,255	601,519
ETHION	2,093	91	5	2	621	53	0	5	0	1
ETHOPROP	5,767	5,470	3,139	3,213	3,784	3,610	3,477	3,542	4,152	6,078
FENAMIPHOS	114,333	112,249	111,729	97,013	72,102	66,100	60,340	36,999	38,397	36,293
FENTHION	0	0	0	0	0	0	0	0	0	0
FONOFOS	58,852	59,041	55,207	36,123	16,926	14,146	2,325	497	234	116
FORMETANATE HYDROCHLORIDE	141,203	100,837	103,521	95,544	77,965	63,047	42,880	45,234	36,131	29,411
MALATHION	401,037	425,062	363,635	410,658	383,121	403,646	323,737	290,933	314,361	287,445
METHAMIDOPHOS	199,314	418,703	313,618	263,816	290,061	158,079	101,494	63,046	37,012	41,506
METHIDATHION	255,006	231,930	245,914	200,528	129,358	115,249	71,992	64,785	48,554	38,516
METHIOCARB	3,394	2,129	1,511	2,906	3,523	2,369	2,700	1,866	1,997	1,757

Table 5B (continued). The reported **cumulative acres treated** with cholinesterase-inhibiting pesticides.

Active Ingredient	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
METHOMYL	1,215,586	1,425,295	1,145,115	1,376,868	1,118,188	880,910	893,424	627,264	509,104	615,609
METHYL PARATHION	137,691	129,976	125,729	125,638	128,675	119,315	43,773	39,449	37,448	51,192
MOLINATE	384,031	348,465	357,239	317,680	267,090	246,084	276,315	190,488	222,044	134,120
NALED	473,011	702,155	338,861	604,615	251,044	279,898	244,617	234,184	154,963	148,781
OXAMYL	115,085	106,205	122,353	176,793	225,380	177,183	179,048	100,294	98,313	115,250
OXYDEMETON-METHYL	226,433	253,868	220,824	244,056	186,964	253,281	225,984	200,171	193,441	189,047
PARATHION	3,404	6,688	5,099	2,071	2,592	1,976	4,025	2,977	7,026	1,016
PEBULATE	76,688	86,494	74,647	69,381	64,501	74,697	51,205	15,122	21,491	10,680
PHENMEDIPHAM	62,694	72,060	52,125	62,449	58,649	73,905	61,975	35,477	34,452	38,265
PHORATE	133,392	111,217	123,789	106,427	109,759	81,724	71,407	63,160	58,391	50,290
PHOSALONE	47	56	18	64	5	0	10	0	0	0
PHOSMET	136,500	172,539	214,416	236,611	312,707	253,234	219,707	189,517	158,970	128,029
POTASSIUM DIMETHYL DITHIO CARBAMATE	6	0	0	0	0	0	0	0	2	6
PROFENOFOS	336,830	296,860	211,769	162,204	44,641	46,250	46,617	23,700	25,997	13,599
PROPAMOCARB HYDROCHLORIDE	0	0	23,793	14,677	81,050	6,851	17,696	2,625	1,041	22
PROPETAMPHOS	0	0	0	0	0	0	0	0	0	0
PROPOXUR	14	5	9	73	45	39	26	4	23	1
S,S,S-TRIBUTYL PHOSPHOROTRITHIOATE	615,978	604,586	531,052	437,505	305,306	245,470	282,844	187,153	129,570	158,604
SODIUM DIMETHYL DITHIO CARBAMATE	0	0	0	0	253	20	0	60	0	0
SULFOTEP	884	537	408	251	241	224	168	314	57	3
SULPROFOS	896	299	0	83	80	0	0	0	0	0
TETRACHLORVINPHOS	780	519	674	356	3,109	1,543	575	232	125	6
THIOBENCARB	91,906	126,745	159,121	227,658	187,295	186,341	252,506	169,056	222,606	154,952
THIODICARB	0	22,785	176,788	223,154	155,440	83,796	50,604	13,382	8,256	12,113
TRICHLORFON	818	1,037	204	149	1,071	97	70	51	19	8
Grand Total	12,051,166	13,664,563	11,666,708	12,137,558	9,940,972	9,227,717	8,484,527	6,960,130	6,392,624	6,395,557

Figure 3. Use trends of cholinesterase-inhibiting pesticides, which includes pesticides with organophosphate and carbamate active ingredients. Reported pounds of active ingredient (AI) applied includes both agricultural and reportable nonagricultural applications. The reported cumulative acres treated includes primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.



USE TRENDS OF PESTICIDES ON DPR'S GROUND WATER PROTECTION LIST

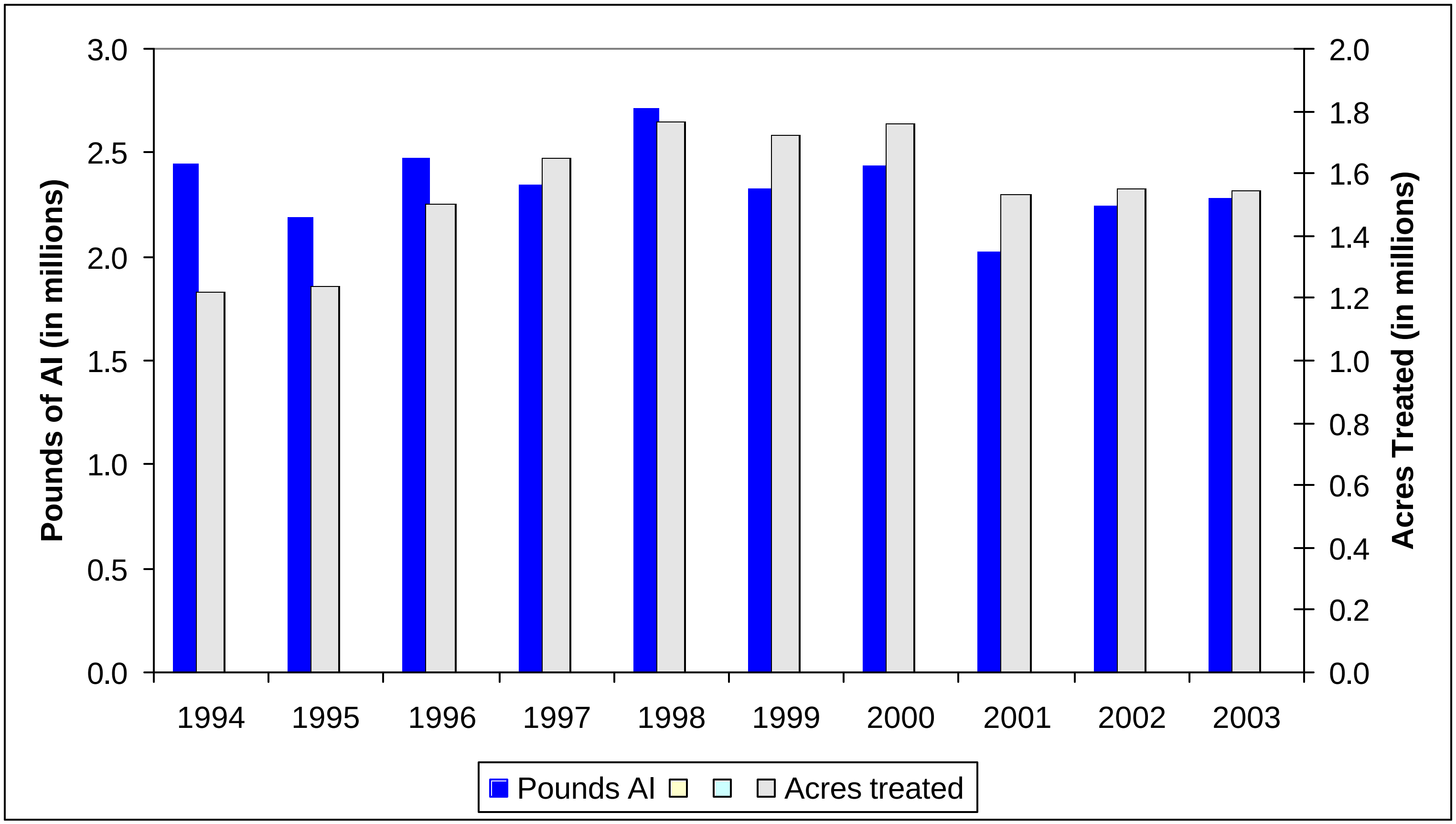
Table 6A. The reported **pounds** of pesticides on DPR's ground water protection list. These pesticides are the currently registered active ingredients listed in section 6800(a) of the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1. Use includes both agricultural and reportable nonagricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
ATRAZINE	46,497	36,078	57,018	46,568	54,840	69,549	57,403	62,872	59,292	58,245
ATRAZINE, OTHER RELATED	2,480	1,932	3,062	2,502	2,943	3,706	1,224	1,321	1,237	1,216
BENTAZON, SODIUM SALT	1,175	655	1,518	1,907	1,757	1,837	1,210	393	1,045	1,216
BROMACIL	104,052	95,444	98,293	82,424	84,645	75,613	67,753	56,128	55,821	56,417
BROMACIL, LITHIUM SALT	11,085	6,517	17,381	9,141	4,686	4,162	4,478	3,217	4,016	3,025
DIURON	1,234,507	1,054,409	1,265,426	1,228,114	1,504,268	1,188,640	1,343,727	1,107,421	1,303,108	1,343,596
NORFLURAZON	154,383	153,138	196,142	212,621	265,886	286,214	257,651	209,981	188,032	146,815
PROMETON	84	117	68	20	22	4	28	2	21	2
SIMAZINE	890,353	837,366	839,209	764,586	794,758	696,574	700,648	587,000	634,176	674,141
Grand Total	2,444,616	2,185,656	2,478,115	2,347,882	2,713,804	2,326,298	2,434,122	2,028,334	2,246,747	2,284,673

Table 6B. The reported **cumulative acres treated** in California with pesticides on DPR's ground water protection list. These pesticides are the currently registered active ingredients listed in section 6800(a) of the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1. Use includes primarily agricultural applications. The grand total for acres treated is less than the sum of acres treated for all active ingredients because some products contain more than one active ingredient. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
ATRAZINE	32,065	22,234	32,043	27,257	37,556	39,881	34,524	33,376	28,589	29,966
ATRAZINE, OTHER RELATED	32,065	22,234	32,042	27,257	37,529	39,876	34,524	33,376	28,589	29,966
BENTAZON, SODIUM SALT	1,688	805	1,460	2,010	1,904	1,968	1,502	432	1,094	987
BROMACIL	65,421	66,289	62,206	58,722	57,136	53,861	42,458	30,149	29,585	27,974
BROMACIL, LITHIUM SALT	0	0	0	0	40	40	30	0	0	0
DIURON	454,829	507,279	685,352	819,993	865,246	849,482	864,334	788,559	796,903	843,154
NORFLURAZON	139,498	133,585	179,015	186,991	214,144	217,178	230,836	192,305	161,702	125,619
PROMETON	8	23	27	8	85	18	51	0	174	49
SIMAZINE	589,560	573,735	607,228	613,237	647,072	611,626	619,639	515,419	561,195	546,015
Grand Total	1,218,778	1,238,484	1,505,936	1,651,236	1,769,479	1,721,896	1,757,983	1,532,564	1,551,972	1,547,283

Figure 4. Use trends of pesticides on DPR's ground water protection list. These pesticides are the currently registered active ingredients listed in section 6800(a) of the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1. Reported pounds of active ingredient (AI) applied includes both agricultural and reportable nonagricultural applications. The reported cumulative acres treated includes primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.



USE TRENDS OF PESTICIDES ON DPR'S TOXIC AIR CONTAMINANTS LIST

Table 7A. The reported **pounds** of pesticides on DPR's toxic air contaminants list applied in California. These pesticides are the currently registered active ingredients listed in the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1, section 6860. Use includes both agricultural and reportable non-agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
1,3-DICHLOROPROPENE	2,122	409,821	1,956,846	2,400,930	2,911,385	3,122,723	4,442,193	4,135,462	5,359,193	7,009,034
2,4-D	27,544	23,995	22,089	10,227	3,868	3,060	2,065	1,787	1,691	1,732
2,4-D, 2-ETHYLHEXYL ESTER	71	278	10	1,313	13,750	72,225	12,557	13,706	15,477	19,715
2,4-D, ALKANOLAMINE SALTS (ETHANOL AND ISOPROPANOL AMINES)	28,863	30,642	27,954	25,684	29,061	15,992	6,737	674	452	1,357
2,4-D, BUTOXYETHANOL ESTER	67,414	31,743	38,567	13,263	12,140	5,628	6,107	5,336	3,482	3,812
2,4-D, BUTOXYPROPYL ESTER	1,166	224	61	13	569	5	4	3	0	0
2,4-D, BUTYL ESTER	1	39	0	0	2,169	8	21	<1	593	2
2,4-D, DIETHANOLAMINE SALT	714	1,938	3,003	24,809	14,965	5,843	13,002	6,667	8,080	8,831
2,4-D, DIMETHYLAMINE SALT	399,046	454,658	468,771	428,874	422,673	355,318	426,211	399,644	425,542	512,828
2,4-D, DODECYLAMINE SALT	5	16	8	58	75	730	0	257	322	0
2,4-D, HEPTYLAMINE SALT	0	86	<1	0	0	46	0	0	<1	0
2,4-D, ISOOCTYL ESTER	1,212	13,466	7,822	60,356	46,603	17,387	6,914	15,828	12,343	12,366
2,4-D, ISOPROPYL ESTER	4,508	5,077	5,090	6,543	7,510	6,879	8,260	6,618	7,843	8,322
2,4-D, N-OLEYL-1,3-PROPYLENEDIAMINE SALT	672	37	35	0	3	7	11	0	0	0
2,4-D, OCTYL ESTER	0	15	0	0	0	0	0	0	0	0
2,4-D, PROPYL ESTER	2,326	2,032	1,774	1,575	999	1,822	783	391	634	326
2,4-D, TETRADECYLAMINE SALT	1	4	2	13	17	170	0	60	75	0
2,4-D, TRIETHYLAMINE SALT	121,241	105,656	93,876	34,610	5,688	2,344	1,038	634	426	435
2,4-D, TRIISOPROPYLAMINE SALT	24	6	2	3	5	6	0	5	9	6
ACROLEIN	336,993	362,773	322,578	341,245	264,207	328,238	290,180	233,928	283,541	272,733
ALUMINUM PHOSPHIDE	86,525	80,577	103,858	89,198	67,804	123,419	119,545	100,020	169,224	119,500
ARSENIC ACID	27,571	37,206	53,777	59,835	52,558	48,029	11,906	12,023	4,976	318
ARSENIC PENTOXIDE	86,445	83,814	205,089	64,372	50,899	245,238	91,267	259,386	194,650	165,709
ARSENIC TRIOXIDE	<1	<1	<1	<1	1	1	<1	<1	<1	<1
CAPTAN	608,658	734,314	918,588	799,878	1,559,136	965,922	642,757	399,263	392,205	499,973
CAPTAN, OTHER RELATED	14,890	17,831	21,729	19,448	54,940	22,216	14,617	9,017	8,945	11,344
CARBARYL	820,787	835,811	809,794	753,801	426,893	387,145	365,174	287,802	256,057	205,080
CHLORINE	750,653	2,815,119	330,017	423,469	422,252	628,546	678,417	297,086	502,944	619,735
CHROMIC ACID	120,822	117,092	286,521	89,931	71,109	343,543	128,642	363,205	272,300	232,064
DAZOMET	3,026	5,875	12,851	13,305	12,217	12,409	10,486	44,299	45,020	44,798
DDVP	4,798	6,063	13,097	13,636	13,998	12,325	12,718	12,837	8,524	3,437

Table 7A (continued). The reported **pounds** of pesticides on DPR's toxic air contaminants list applied in California.

Active Ingredient	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
ETHYLENE OXIDE	3	0	0	0	31	2	6	3	0	0
FORMALDEHYDE	11,864	153,519	334,548	403,824	305,297	111,714	55,300	28,612	14,035	18,690
HYDROGEN CHLORIDE	206	224	1,938	129	762	11,067	3,316	4,276	4,256	3,222
LINDANE	5,281	4,507	4,576	5,388	6,293	4,842	4,738	2,388	1,633	908
MAGNESIUM PHOSPHIDE	1,892	2,703	2,163	2,362	4,132	3,540	3,541	2,492	4,811	2,844
MANCOZEB	464,924	659,240	567,866	526,364	987,270	630,968	611,498	430,604	396,672	538,033
MANEB	912,903	1,257,122	1,328,318	1,081,124	1,596,876	1,045,567	1,203,483	817,059	851,643	1,026,685
META-CRESOL	2	2	3	6	8	11	14	1	1	1
METAM-SODIUM	11,122,361	14,975,528	15,253,924	14,969,732	13,729,306	16,774,246	13,218,764	12,545,403	15,137,719	14,815,687
METHANOL	100	27	0	0	0	3	<1	0	0	0
METHOXYCHLOR	692	1,049	484	358	566	16	26	41	144	3
METHOXYCHLOR, OTHER RELATED	90	139	62	44	11	<1	0	<1	0	0
METHYL BROMIDE	16,607,324	17,165,964	16,022,069	15,663,832	13,569,875	15,300,388	10,869,241	6,618,631	6,550,818	7,384,398
METHYL ISOTHIOCYANATE	2,219	123	0	353	220	616	3,323	2,871	3,512	547
METHYL PARATHION	129,155	140,469	130,614	153,187	158,228	157,594	75,169	59,620	53,644	73,337
NAPHTHALENE	1	<1	0	1	333	<1	0	0	<1	23
PARA-DICHLOROBENZENE	3	2	4	3	219	86	4	11	1	25
PARATHION	6,104	13,642	14,050	5,187	5,766	4,041	3,581	2,589	3,205	621
PCNB	91,601	109,755	83,087	89,548	88,036	67,424	62,224	50,341	43,387	38,821
PCP, OTHER RELATED	5	<1	<1	1	2	11	54	2	2	<1
PCP, SODIUM SALT	0	0	0	0	2	0	0	<1	0	0
PCP, SODIUM SALT, OTHER RELATED	0	0	0	0	0	0	0	0	0	0
PENTACHLOROPHENOL	40	3	3	8	33	92	466	14	17	3
PHENOL	296	300	25	8	44	12	20	30	0	<1
PHOSPHINE	0	0	0	0	0	0	0	44	901	1,141
PHOSPHORUS	29	34	58	14	12	9	22	3	1	1
POTASSIUM N-METHYLDITHIO CARBAMATE	0	0	0	0	9,143	0	105,364	137,098	449,804	581,840
POTASSIUM PERMANGANATE	0	0	0	0	243	0	0	0	0	0
PROPOXUR	2,667	3,296	1,341	1,760	1,604	1,735	2,141	611	449	304
PROPYLENE OXIDE	41,815	131,593	224,495	198,559	198,595	172,556	118,381	99,727	99,674	99,396
S,S,S-TRIBUTYL PHOSPHOROTRITHIOATE	892,441	866,726	760,809	626,684	440,382	345,842	396,827	257,062	190,149	233,640
SODIUM CYANIDE	1,754	1,347	1,338	2,197	3,280	1,098	2,178	2,437	2,542	2,808
SODIUM DICHROMATE	0	0	180,478	182,185	122,647	32,699	122	329	633	217
SODIUM TETRATHIOCARBONATE	63,620	226,590	543,229	799,092	898,145	688,701	596,028	375,487	352,342	212,308
TRIFLURALIN	1,261,342	1,380,785	1,143,695	1,191,780	1,219,810	1,260,536	1,162,359	934,584	1,093,884	1,062,581
XYLENE	29,001	17,944	12,619	8,511	5,366	4,847	4,292	9,544	2,680	4,360
ZINC PHOSPHIDE	2,933	1,610	1,217	2,326	1,200	5,447	1,607	1,120	980	1,252
Grand Total	35,170,769	43,290,450	42,316,825	41,590,956	39,821,232	43,352,935	35,795,701	28,988,970	33,234,086	35,857,153

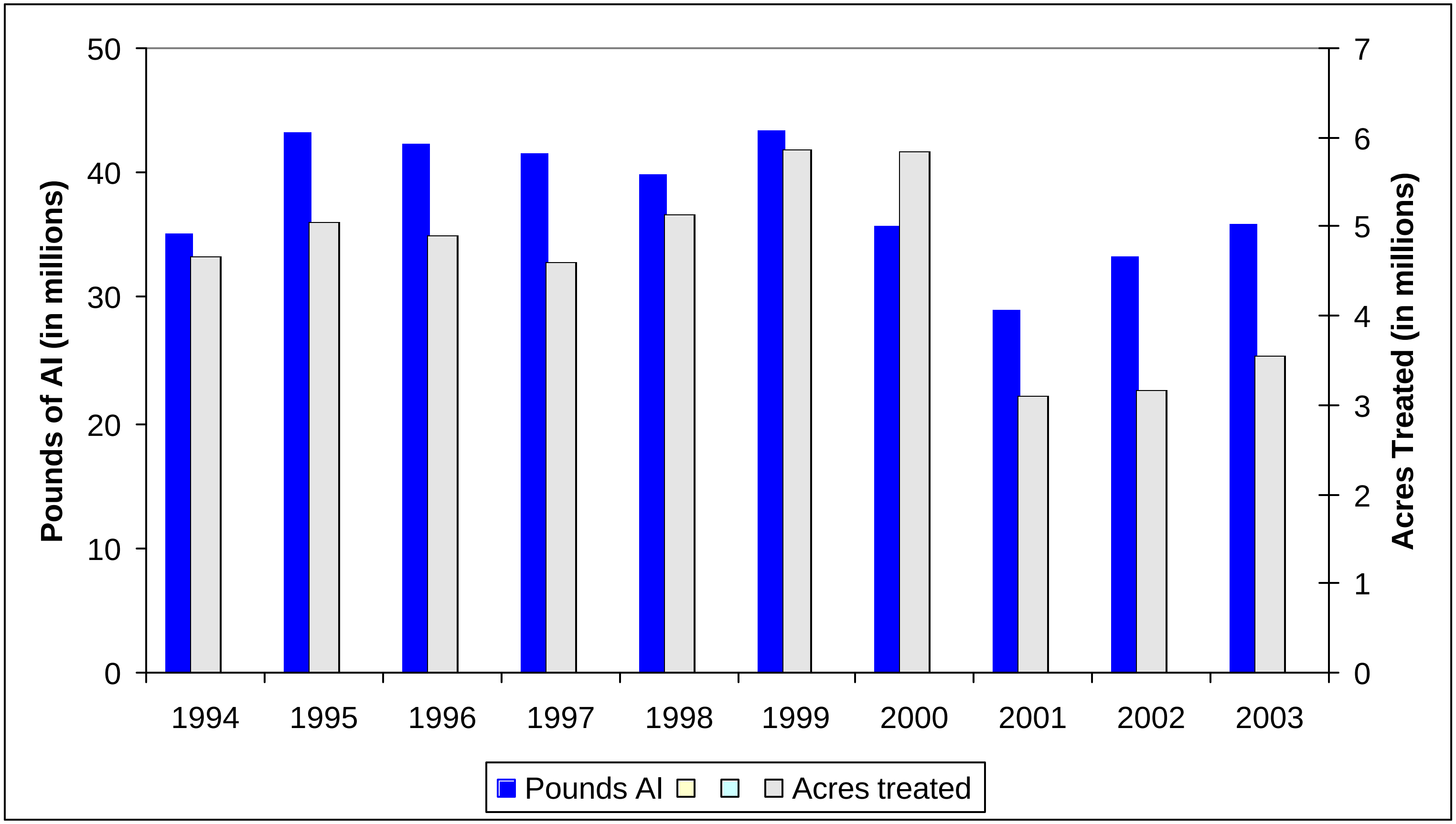
Table 7B. The reported **cumulative acres treated** in California with pesticides on DPR's toxic air contaminants list. These pesticides are the currently registered active ingredients listed in the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1, section 6860. Use includes primarily agricultural applications. The grand total for acres treated is less than the sum of acres treated for all active ingredients because some products contain more than one active ingredient. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1,3-DICHLOROPROPENE	33	4,174	17,223	22,193	27,059	29,430	33,101	30,817	42,064	48,944
2,4-D	156,563	151,453	137,230	50,709	11,649	7,791	5,054	3,952	2,295	2,562
2,4-D, 2-ETHYLHEXYL ESTER	65	385	160	729	6,867	7,624	7,833	6,919	9,906	22,426
2,4-D, ALKANOLAMINE SALTS (ETHANOL AND ISOPROPANOL AMINES)	26,138	22,298	21,872	20,055	22,117	11,843	5,711	359	264	630
2,4-D, BUTOXYETHANOL ESTER	46,343	29,933	35,599	13,504	13,798	7,198	7,013	5,633	2,565	2,539
2,4-D, BUTOXYPROPYL ESTER	100	5	2	51	105	37	5	9	0	0
2,4-D, BUTYL ESTER	0	0	0	0	307	37	24	1	101	0
2,4-D, DIETHANOLAMINE SALT	933	4,683	8,721	88,149	58,239	23,884	49,357	27,705	36,290	39,046
2,4-D, DIMETHYLAMINE SALT	474,599	524,146	540,728	527,870	477,967	411,858	495,513	475,796	491,048	595,257
2,4-D, DODECYLAMINE SALT	0	0	0	76	82	1,481	0	262	276	0
2,4-D, HEPTYLAMINE SALT	0	18	<1	0	0	29	0	0	0	0
2,4-D, ISOOCTYL ESTER	379	3,497	5,163	35,045	29,179	14,449	3,970	16,375	6,925	9,476
2,4-D, ISOPROPYL ESTER	63,244	72,878	69,081	87,492	101,141	100,837	103,938	88,849	108,908	116,859
2,4-D, N-OLEYL-1,3-PROPYLENEDIAMINE SALT	449	36	26	0	2	3	0	0	0	0
2,4-D, OCTYL ESTER	0	0	0	0	0	0	0	0	0	0
2,4-D, PROPYL ESTER	28,812	22,655	23,846	21,479	14,356	15,542	11,278	5,200	7,468	5,509
2,4-D, TETRADECYLAMINE SALT	0	0	0	76	82	1,481	0	262	276	0
2,4-D, TRIETHYLAMINE SALT	152,474	146,454	131,679	46,600	7,381	2,638	1,311	1,257	688	1,035
2,4-D, TRIISOPROPYLAMINE SALT	0	0	0	0	0	0	0	0	0	0
ACROLEIN	888	3,190	2,462	1,514	292	3,981	873	1,409	2,206	642
ALUMINUM PHOSPHIDE	120,397	92,977	80,217	66,017	74,441	1,034,732	1,271,629	67,422	70,176	73,864
ARSENIC ACID	0	0	0	0	0	0	0	0	0	0
ARSENIC PENTOXIDE	660	0	0	0	0	0	709,893	56	0	0
ARSENIC TRIOXIDE	0	0	0	0	0	0	0	0	1	<1
CAPTAN	244,164	295,860	381,989	347,631	602,684	404,731	309,768	215,969	213,438	271,140
CAPTAN, OTHER RELATED	244,097	295,831	381,989	347,235	602,585	404,511	309,116	215,958	213,388	270,968
CARBARYL	291,147	305,452	312,058	292,721	197,664	216,991	196,264	147,612	106,590	97,811
CHLORINE	0	290	0	1,005	1,329	46,611	37,220	95	150	650
CHROMIC ACID	660	0	0	0	0	0	709,893	56	0	0
DAZOMET	59	384	863	1,099	3,589	243	222	224	136	326
DDVP	1,888	1,887	1,499	2,596	3,692	2,180	2,336	3,954	4,327	2,576

Table 7B (continued). The reported **cumulative acres treated** in California with pesticides on the toxic air contaminants list.

Active Ingredient	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
ETHYLENE OXIDE	0	0	0	0	194	31	41	0	0	0
FORMALDEHYDE	15	137	234	12	126	123	47	53	33	18
HYDROGEN CHLORIDE	1	0	1	0	16	0	0	27	590	273
LINDANE	22,984	19,380	25,352	36,573	32,650	20,930	14,628	13,832	8,010	8,828
MAGNESIUM PHOSPHIDE	0	23	19	26	184	616,017	46	373	7	167
MANCOZEB	273,836	405,494	351,801	284,134	682,979	387,300	363,260	228,275	197,055	276,096
MANEB	512,009	652,122	731,079	624,123	942,083	629,897	611,717	535,105	554,787	659,893
META-CRESOL	930	1,279	1,309	3,488	1,407	657	3,142	517	267	244
METAM-SODIUM	183,625	199,457	215,899	198,395	154,309	186,300	146,847	125,263	141,357	142,396
METHANOL	0	0	0	0	0	0	14	0	0	0
METHOXYCHLOR	220	30	19	131	194	140	197	88	24	0
METHOXYCHLOR, OTHER RELATED	70	5	9	52	5	0	0	0	0	0
METHYL BROMIDE	106,694	107,933	96,507	103,068	90,107	102,125	75,741	60,892	53,100	55,251
METHYL ISOTHIOCYANATE	0	0	0	0	47	100	0	0	0	0
METHYL PARATHION	137,691	129,976	125,729	125,638	128,675	119,315	43,773	39,449	37,448	51,192
NAPHTHALENE	0	0	0	0	0	0	0	0	20	0
PARA-DICHLOROBENZENE	0	0	0	0	10	0	0	0	0	0
PARATHION	3,404	6,688	5,099	2,071	2,592	1,976	4,025	2,977	7,026	1,016
PCNB	55,371	53,079	44,187	29,169	39,090	28,324	28,628	25,832	9,533	7,759
PCP, OTHER RELATED	2	<1	15	4	15	0	59	38	0	0
PCP, SODIUM SALT	0	0	0	0	20	0	0	0	0	0
PCP, SODIUM SALT, OTHER RELATED	0	0	0	0	0	0	0	0	0	0
PENTACHLOROPHENOL	2	<1	15	4	190	0	59	38	0	0
PHENOL	6,126	7,947	718	37	275	459	5	501	0	25
PHOSPHINE	0	0	0	0	0	0	0	0	0	0
PHOSPHORUS	3,435	1,908	69	790	965	5,701	2,847	252	0	0
POTASSIUM N-METHYLDITHIO CARBAMATE	0	0	0	21	50	0	534	2,321	9,073	12,887
POTASSIUM PERMANGANATE	0	0	0	0	20	0	0	0	0	0
PROPOXUR	14	5	9	73	45	39	26	4	23	1
PROPYLENE OXIDE	0	0	0	<1	0	573	0	0	<1	0
S,S,S-TRIBUTYL PHOSPHOROTRITHIOATE	615,978	604,586	531,052	437,505	305,306	245,470	282,844	187,153	129,570	158,604
SODIUM CYANIDE	82,520	6,040	3,020	84,800	53,285	0	0	0	0	0
SODIUM DICHROMATE	0	0	0	0	0	0	0	0	0	0
SODIUM TETRATHIOCARBONATE	3,706	12,997	27,736	35,473	34,488	24,947	21,002	13,574	11,559	6,832
TRIFLURALIN	1,160,072	1,282,997	1,086,892	1,131,033	1,083,219	1,159,648	1,038,856	800,893	944,334	903,654
XYLENE	28,673	28,870	24,221	13,568	11,327	3,325	6,208	9,665	4,533	7,512
ZINC PHOSPHIDE	27,654	16,101	22,801	26,756	18,833	38,101	16,349	11,069	7,049	8,387
Grand Total	4,656,488	5,042,019	4,892,104	4,591,003	5,142,630	5,870,168	5,842,438	3,111,086	3,173,973	3,540,993

Figure 5. Use trends of pesticides on DPR's toxic air contaminants list. These pesticides are the currently registered active ingredients listed in the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1, section 6860. Reported pounds of active ingredient (AI) applied includes both agricultural and reportable nonagricultural applications. The reported cumulative acres treated includes primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.



USE TRENDS OF OIL PESTICIDES

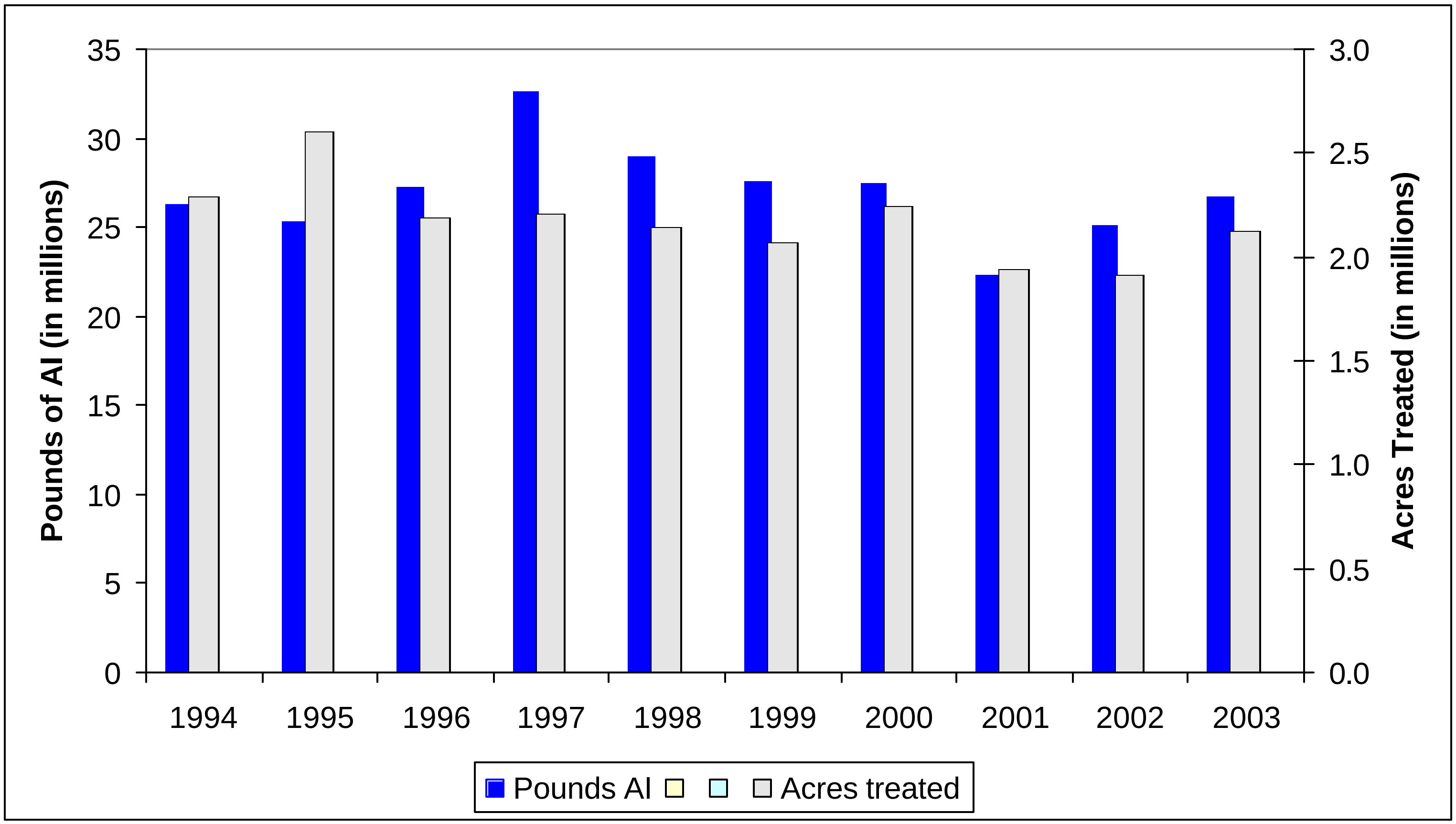
Table 8A. The reported **pounds** of oil pesticides. As a broad group, oil pesticides and other petroleum distillates are on U.S. EPA's list of B2 carcinogens or the State's Proposition 65 list of chemicals "known to cause cancer." However, these classifications do not distinguish among oil pesticides that may not qualify as carcinogenic due to their degree of refinement. Many such oil pesticides also serve as alternatives to high-toxicity chemicals. For this reason, oil pesticide data was classified separately in this report. Use includes both agricultural and reportable nonagricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
COAL TAR HYDROCARBONS	0	0	0	0	0	0	0	50	<1	0
HYDROTREATED PARAFFINIC SOLVENT	0	0	0	0	0	0	0	0	0	284,236
ISOPARAFFINIC HYDROCARBONS	8	10	5	2	35	8	13	1	1,928	23,782
KEROSENE	152,200	145,743	120,700	101,293	90,108	70,398	84,562	48,304	18,404	12,407
MINERAL OIL	3,444,484	3,350,535	4,797,876	5,542,530	5,286,094	4,418,280	3,911,471	3,654,856	5,054,070	6,280,443
NAPHTHA, HEAVY AROMATIC	27	26	143	83	0	0	0	29	0	2
PETROLEUM DERIVATIVE RESIN	551	4	94	15	6	1	3	1	<1	1
PETROLEUM DISTILLATES	2,279,717	2,459,518	1,705,072	1,791,012	1,604,775	2,416,054	2,299,176	1,739,436	1,565,116	1,879,545
PETROLEUM DISTILLATES, ALIPHATIC	0	0	0	0	0	0	<1	7	49,237	15,163
PETROLEUM DISTILLATES, AROMATIC	64,526	31,535	14,630	13,961	35,085	9,925	10,400	2,851	6,202	2,916
PETROLEUM DISTILLATES, REFINED	63,524	45,967	38,396	45,094	60,337	114,329	927,949	842,758	286,978	371,482
PETROLEUM HYDROCARBONS	183,214	234,001	266,895	210,042	236,590	121,783	143,090	219,545	216,917	985
PETROLEUM NAPHTHENIC OILS	320	0	12	1	9	2	3	91	325	208
PETROLEUM OIL, PARAFFIN BASED	440,464	434,878	312,359	267,704	0	310,988	344,350	342,367	283,487	367,051
PETROLEUM OIL, UNCLASSIFIED	19,674,078	18,687,636	20,063,955	24,633,153	21,723,758	20,084,263	19,797,620	15,447,561	17,656,554	17,447,935
PETROLEUM SULFONATES	1	<1	4	1	<1	<1	1	<1	<1	0
Grand Total	26,303,115	25,389,853	27,320,140	32,604,892	29,036,797	27,546,031	27,518,636	22,297,858	25,139,218	26,686,154

Table 8B. The reported **cumulative acres treated** in California with oil pesticides. (See qualifying comments on U.S. EPA B2 carcinogen and Proposition 65 listing with Table 8A.) Uses include primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
COAL TAR HYDROCARBONS	0	0	0	0	0	0	0	0	0	0
HYDROTREATED PARAFFINIC SOLVENT	0	0	0	0	0	0	0	0	0	306,243
ISOPARAFFINIC HYDROCARBONS	<1	0	0	0	0	0	0	0	4,490	56,120
KEROSENE	284,864	333,112	289,469	240,080	223,822	179,961	227,734	138,896	29,561	21,672
MINERAL OIL	130,688	144,413	190,550	191,954	615,564	163,976	157,520	169,885	199,089	286,423
NAPHTHA, HEAVY AROMATIC	0	0	0	0	0	0	0	11	0	0
PETROLEUM DERIVATIVE RESIN	1,321	3	191	50	13	1	0	0	0	0
PETROLEUM DISTILLATES	340,671	440,375	369,500	299,592	265,736	223,509	274,543	213,784	210,437	236,822
PETROLEUM DISTILLATES, ALIPHATIC	0	0	0	0	0	0	0	5,104	44,494	26,131
PETROLEUM DISTILLATES, AROMATIC	66,414	53,211	12,324	19,003	2,153	7,088	6,238	1,900	3,935	1,804
PETROLEUM DISTILLATES, REFINED	4,173	3,976	5,145	6,146	6,162	12,495	42,145	48,446	35,407	39,838
PETROLEUM HYDROCARBONS	191,965	248,347	193,257	200,989	276,950	237,043	258,740	289,094	273,322	2,869
PETROLEUM NAPHTHENIC OILS	540	0	73	0	50	37	0	5,119	13,241	11,314
PETROLEUM OIL, PARAFFIN BASED	664,715	680,590	464,508	443,059	0	470,204	461,939	445,342	416,483	488,928
PETROLEUM OIL, UNCLASSIFIED	603,690	703,859	663,575	811,902	753,904	775,828	817,752	631,471	703,820	667,064
PETROLEUM SULFONATES	0	<1	<1	<1	0	<1	10	0	0	0
Grand Total	2,288,491	2,607,726	2,188,420	2,212,690	2,144,304	2,070,045	2,246,598	1,937,975	1,914,147	2,124,920

Figure 6. Use trends of oil pesticides. As a broad group, oil pesticides and other petroleum distillates are on U.S. EPA's list of B2 carcinogens or the State's Proposition 65 list of chemicals "known to cause cancer." However, these classifications do not distinguish among oil pesticides that may not qualify as carcinogenic due to their degree of refinement. Many such oil pesticides also serve as alternatives to high-toxicity chemicals. For this reason, oil pesticide data was classified separately in this report. Reported pounds of active ingredient (AI) applied includes both agricultural and reportable nonagricultural applications. The reported cumulative acres treated includes primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.



USE TRENDS OF REDUCED-RISK PESTICIDES

Table 9A. The reported **pounds** of reduced-risk pesticides applied in California. These active ingredients are contained in pesticide products that have been given reduced-risk status by U.S. EPA. Use includes both agricultural and reportable nonagricultural applications. Zero values in early years likely indicate the pesticide was not yet registered for use. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
1-METHYLCYCLOPROPENE	0	0	0	0	0	0	0	<1	<1	<1
ACETAMIPRID	0	0	0	0	0	0	0	0	6,434	26,628
ACIBENZOLAR-S-METHYL	0	0	0	0	0	0	0	230	1,157	1,159
AZOXYSTROBIN	0	0	0	23,851	69,232	95,723	114,968	85,600	95,827	97,516
BIFENAZATE	0	0	0	0	0	0	92	523	24,719	42,866
BISPYRIBAC-SODIUM	0	0	0	0	0	0	0	0	2,378	2,219
BUPROFEZIN	0	0	0	6,987	8,459	22,244	678	3,439	22,302	33,510
CARBO METHOXY ETHER CELL	92	184	22,994	1,032	723	638	436	543	6	0
CARFENTRAZONE-ETHYL	0	0	0	0	3,076	2,730	0	492	2,128	14,196
CINNAMALDEHYDE	0	0	0	<1	<1	6,764	10,332	4,704	806	238
CORN GLUTEN MEAL	0	0	0	0	0	2,490	4,590	2,744	1,294	8
CYPRODINIL	0	0	0	0	48,417	56,268	98,773	81,216	99,483	121,341
FENHEXAMID	0	0	0	0	0	12,386	36,240	39,583	50,073	64,535
FIPRONIL	0	0	0	<1	1	2	662	7,856	15,017	32,756
FLUDIOXONIL	0	0	0	0	551	349	568	974	5,021	7,369
FORCHLORFENURON	0	0	0	0	0	0	0	43	35	139
HEXAFLUMURON	0	<1	<1	<1	2	8	8	12	93	21
IMAZAMOX, AMMONIUM SALT	0	0	0	0	0	0	0	0	1,490	2,668
INDOXACARB	0	0	0	0	0	0	3,535	29,016	27,098	70,058
IRON PHOSPHATE	0	0	0	0	66	187	344	617	545	855
MEFENOXAM	0	0	43	29,078	59,960	55,942	60,426	49,967	54,562	60,964
METHYL ANTHRANILATE	0	0	6	184	49	57	50	37	85	34
NOVALURON	0	0	0	0	0	0	0	0	2	24

Table 9A (continued). The reported **pounds** of reduced-risk pesticides applied in California.

Active Ingredient	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
OIL OF PEPPERMINT	0	0	0	0	0	0	0	<1	0	<1
OXYPURINOL	0	0	0	0	0	0	<1	<1	0	0
POTASSIUM BICARBONATE	0	0	0	28	65,909	92,990	130,462	121,804	179,676	283,851
PROHEXADIONE CALCIUM	0	0	0	0	0	0	0	46	52	153
PYMETROZINE	0	0	0	0	0	18	829	1,284	1,420	2,226
PYRIPROXYFEN	0	0	0	3,220	6,072	3,096	14,040	7,663	9,782	10,796
SODIUM BICARBONATE	0	0	0	0	0	5	22	230	2,063	0
SPINOSAD	0	0	0	10,146	29,717	44,573	55,443	51,071	53,574	61,613
TEBUFENOZIDE	0	7,955	3,463	5,300	9,178	8,815	62,310	65,724	65,094	93,057
THIAMETHOXAM	0	0	0	0	0	0	0	0	10,897	10,187
TRIFLOXYSTROBIN	0	0	0	0	0	0	45,938	12,303	18,321	21,234
XANTHINE	0	0	0	0	0	0	<1	<1	0	0
Grand Total	92	8,138	26,506	79,825	301,413	405,284	640,744	567,721	751,434	1,062,221

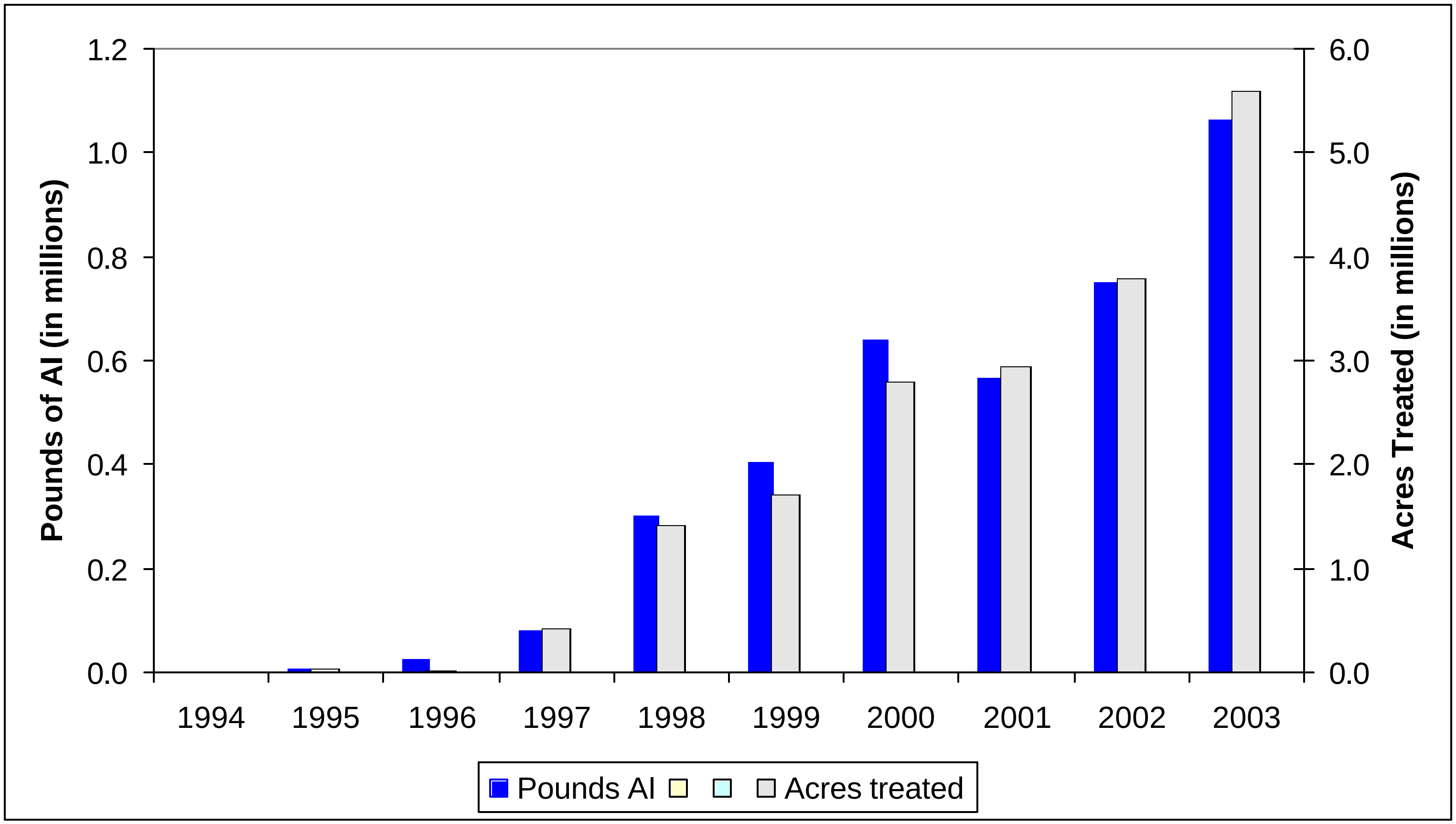
Table 9B. The reported **cumulative acres treated** of reduced-risk pesticides in California. These active ingredients are contained in pesticide products that have been given reduced-risk status by U.S. EPA. Use includes primarily agricultural applications. Zero values in early years likely indicate the pesticide was not yet registered for use. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1-METHYLCYCLOPROPENE	0	0	0	0	0	0	0	3	<1	9
ACETAMIPRID	0	0	0	0	0	0	0	0	87,041	423,398
ACIBENZOLAR-S-METHYL	0	0	0	0	0	0	0	8,266	39,749	38,316
AZOXYSTROBIN	0	0	0	28,421	340,507	449,776	581,810	444,032	511,046	690,373
BIFENAZATE	0	0	0	0	0	0	249	2,173	58,876	97,369
BISPYRIBAC-SODIUM	0	0	0	0	0	0	0	0	80,499	70,514
BUPROFEZIN	0	0	0	18,623	8,382	15,801	1,966	10,012	32,716	61,238
CARBO METHOXY ETHER CELLUL	61	113	235	328	83	77	197	484	5	0
CARFENTRAZONE-ETHYL	0	0	0	0	38,578	17,800	0	7,027	16,440	167,610
CINNAMALDEHYDE	0	0	0	<1	<1	2,418	4,136	1,534	295	105
CORN GLUTEN MEAL	0	0	0	0	0	0	0	7	3	0
CYPRODINIL	0	0	0	0	122,772	186,536	314,850	282,736	346,342	412,877
FENHEXAMID	0	0	0	0	0	18,455	57,100	70,069	84,525	113,987
FIPRONIL	0	0	0	0	0	0	0	1	1	1
FLUDIOXONIL	0	0	0	0	0	1,102	343	431	21,654	29,962
FORCHLORFENURON	0	0	0	0	0	0	0	786	882	1,455
HEXAFLUMURON	0	0	0	0	0	0	0	1	0	2
IMAZAMOX, AMMONIUM SALT	0	0	0	0	0	0	0	0	34,700	60,827
INDOXACARB	0	0	0	0	0	0	33,833	390,579	365,901	900,278
IRON PHOSPHATE	0	0	0	0	205	470	852	1,036	1,929	1,253
MEFENOXAM	0	0	40	153,858	360,994	335,708	406,191	273,020	283,752	308,528
METHYL ANTHRANILATE	0	0	0	0	0	0	0	0	81	56
NOVALURON	0	0	0	0	0	0	0	0	34	319

Table 9B (continued). The reported **cumulative acres treated** in California with each reduced-risk pesticide.

Active Ingredient	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
OIL OF PEPPERMINT	0	0	0	0	0	0	0	0	0	0
OXYPURINOL	0	0	0	0	0	0	0	0	0	0
POTASSIUM BICARBONATE	0	0	0	11	34,010	52,110	60,330	52,654	73,894	106,955
PROHEXADIONE CALCIUM	0	0	0	0	0	0	0	156	341	852
PYMETROZINE	0	0	0	0	0	98	4,520	10,421	10,859	17,641
PYRIPROXYFEN	0	0	0	60,164	64,648	35,307	72,934	100,297	142,040	197,811
SODIUM BICARBONATE	0	0	0	0	0	8	0	0	0	0
SPINOSAD	0	0	0	128,313	384,192	541,190	680,424	694,687	731,544	806,260
TEBUFENOZIDE	0	32,418	14,449	28,620	53,705	52,379	387,464	399,966	348,320	523,303
THIAMETHOXAM	0	0	0	0	0	0	0	0	255,350	270,843
TRIFLOXYSTROBIN	0	0	0	0	0	0	198,588	201,521	278,530	312,257
XANTHINE	0	0	0	0	0	0	0	0	0	0
Grand Total	61	32,531	14,724	418,337	1,408,077	1,709,237	2,805,785	2,951,775	3,791,152	5,588,583

Figure 7. Use trends of reduced-risk pesticides. These active ingredients are contained in pesticide products that have been given reduced-risk status by U.S. EPA. Reported pounds of active ingredient (AI) applied includes both agricultural and reportable nonagricultural applications. The reported cumulative acres treated includes primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.



USE TRENDS OF BIOPESTICIDES

Table 10A. The reported **pounds** of biopesticides applied in California. Biopesticides include microorganisms and naturally occurring compounds, or compounds essentially identical to naturally occurring compounds that are not toxic to the target pest (such as pheromones). Use includes both agricultural and reportable nonagricultural applications. Zero values in early years likely indicate the pesticide was not yet registered for use. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
(E)-4-TRIDECEN-1-YL-ACETATE	3	12	140	76	65	67	263	182	247	254
(E)-5-DECENOL	0	12	71	737	176	246	5	2	2	295
(E)-5-DECENYL ACETATE	0	58	339	3,508	844	1,183	26	9	12	889
(R,Z)-5-(1-DECENYL) DIHYDRO-2-(3H)-FURANONE	0	<1	0	0	<1	0	<1	0	0	0
(S)-KINOPRENE	11	18	137	121	1,274	357	245	311	326	417
(Z)-11-HEXADECEN-1-YL ACETATE	0	0	0	0	0	0	0	0	35	10
(Z)-11-HEXADECENAL	0	0	0	0	0	0	0	0	35	10
(Z)-4-TRIDECEN-1-YL-ACETATE	<1	<1	4	2	2	2	9	6	8	8
(Z,E)-7,11-HEXADECADIEN-1-YL ACETATE	3	29	2	1	46	229	3	13	2	3
(Z,Z)-7,11-HEXADECADIEN-1-YL ACETATE	3	2	2	1	46	242	3	<1	3	3
1-DECANOL	1	1	1	<1	<1	<1	<1	<1	0	0
1-METHYLCYCLOPROPENE	0	0	0	0	0	0	0	<1	<1	<1
1-NAPHTHALENEACETAMIDE	72	54	99	115	283	333	217	213	88	119
ACETIC ACID	<1	0	0	0	0	0	0	0	0	<1
AGROBACTERIUM RADIOBACTER	4	6	14	28	20	7	2	1	4	3
AGROBACTERIUM RADIOBACTER, STRAIN K1026	0	0	0	0	0	0	<1	<1	1	<1
ALLYL ISOTHIOCYANATE	0	0	0	<1	0	0	<1	<1	<1	<1
AMINO ETHOXY VINYL GLYCINE HYDROCHLORIDE	0	0	0	0	0	1	<1	1	1	0
AMPELOMYCES QUISQUALIS	0	<1	3	9	40	4	4	2	<1	<1
AZADIRACHTIN	71	558	812	840	653	16,764	1,234	1,536	1,483	1,366
BACILLUS PUMILUS, STRAIN QST 2808	0	0	0	0	0	0	0	0	0	<1
BACILLUS SPHAERICUS, SEROTYPE H-5A5B, STRAIN 2362	0	0	0	1,298	4,886	2,274	2,746	7,941	4,667	10,122
BACILLUS SUBTILIS GB03	0	0	0	<1	<1	<1	<1	1	4	5
BACILLUS THURINGIENSIS (BERLINER)	476	1,562	536	179	751	115	112	335	44	11
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, GC-91 PROTEIN	1,936	5,115	6,520	7,406	4,273	3,017	4,419	3,953	3,972	5,024
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	4,935	8,050	10,145	14,210	10,854	10,427	9,065	5,540	5,881	7,548
BACILLUS THURINGIENSIS (BERLINER), SUBSP. ISRAELENSIS, SEROTYPE H-14	4,619	6,827	4,059	4,423	12,963	5,038	88,039	24,795	9,778	17,335
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI STRAIN SA-12	0	0	0	0	0	0	1,562	1,510	4,962	5,754
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, SEROTYPE 3A,3B	39,667	39,550	25,890	29,825	20,535	14,154	13,145	30,166	2,667	6,318
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN EG 2348	2,714	3,391	3,056	1,448	4,548	1,360	1,810	738	1,228	66

Table 10A (continued). The reported **pounds** of biopesticides applied in California.

Active Ingredient	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN EG2371	7,042	7,466	3,468	2,752	1,633	213	139	58	19	39
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11	6,416	8,643	8,689	11,676	9,603	8,730	9,931	12,583	13,391	12,879
BACILLUS THURINGIENSIS (BERLINER), SUBSP. SAN DIEGO	10	1	3	26	8	34	18	8	1	2
BACILLUS THURINGIENSIS SUBSPECIES KURSTAKI STRAIN BMP 123	0	0	0	0	6	1	33	79	164	130
BACILLUS THURINGIENSIS SUBSPECIES KURSTAKI, GENETICALLY ENGINEERED STRAIN EG7841 LEPIDOPTERAN ACTIVE TOXIN	0	0	257	15,619	12,522	12,831	16,679	8,749	681	1,503
BACILLUS THURINGIENSIS VAR. KURSTAKI STRAIN M-200	0	0	0	0	0	0	<1	<1	0	<1
BACILLUS THURINGIENSIS VAR. KURSTAKI, GENETICALLY ENGINEERED STRAIN EG7826	0	0	0	0	0	0	6,482	14,734	439	1,527
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	0	0	0	0	0	0	0	0	0	21,956
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN SD-1372, LEPIDOPTERAN ACTIVE TOXIN(S)	0	0	0	0	0	3	158	498	1,295	562
BACILLUS THURINGIENSIS, SUBSP. ISRAELENSIS, STRAIN AM 65-52	0	0	0	0	0	0	0	0	9,485	29,326
BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES	0	0	0	0	0	0	0	0	47	538
BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN HD-1	0	0	<1	57	20,771	21,652	21,081	16,917	24,388	38,698
BACILLUS THURINGIENSIS, VAR. KURSTAKI DELTA ENDOTOXINS CRY 1A(C) AND CRY 1C (GENETICALLY ENGINEERED) ENCAPSULATED IN PSEUDOMONAS FLUORESCENS (KILLED)	0	0	3,663	29,895	12,634	8,048	7,146	2,211	258	54
BEAUVERIA BASSIANA STRAIN GHA	0	0	1	573	1,243	914	913	678	1,032	715
CANDIDA OLEOPHILA ISOLATE I-182	0	0	0	305	103	55	0	0	0	0
CANOLA OIL	0	0	0	0	0	0	1	5	<1	1
CAPSICUM OLEORESIN	220	19	46	2	17	104	3	73	4	5
CASTOR OIL	4	<1	1	40	174	24	557	297	504	1,281
CINNAMALDEHYDE	0	0	0	<1	<1	6,764	10,332	4,704	806	238
CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	0	0	3,196	13,792	55,005	94,569	111,246	83,800	73,345	60,429
CODLING MOTH GRANULOSIS VIRUS	0	321	0	0	0	0	0	0	0	0
CONIOTHYRIUM MINITANS STRAIN CON/M/91-08	0	0	0	0	0	0	0	0	103	182
CYTOKININ	0	<1	0	0	<1	0	<1	<1	0	<1
DIHYDRO-5-HEPTYL-2(3H)-FURANONE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
DIHYDRO-5-PENTYL-2(3H)-FURANONE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
E,E-8,10-DODECADIEN-1-OL	214	1,067	253	431	220	21,029	6,278	6,390	5,126	1,807
E-11-TETRADECEN-1-YL ACETATE	0	0	0	3	2	548	397	65	122	131
E-8-DODECENYL ACETATE	25	38	27	46	57	66	92	73	59	113

Table 10A (continued). The reported **pounds** of biopesticides applied in California.

Active Ingredient	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
ENCAPSULATED DELTA ENDOTOXIN OF BACILLUS THURINGIENSIS VAR. KURSTAKI IN KILLED PSEUDOMONAS FLUORESCENS	14,341	14,535	30,809	43,815	35,129	28,435	17,904	6,913	3,174	445
ENCAPSULATED DELTA ENDOTOXIN OF BACILLUS THURINGIENSIS VAR. SAN DIEGO IN KILLED PSEUDOMONAS FLUORESCENS	0	7	13	0	34	1	6	1	6	0
ESSENTIAL OILS	1	<1	0	<1	11	<1	<1	<1	<1	<1
ETHYLENE	0	0	0	0	1	5,073	6	6	3	24
EUGENOL	0	<1	0	0	3	0	<1	0	0	0
FARNESOL	28	39	53	38	30	36	37	15	10	9
GAMMA AMINOBUTYRIC ACID	0	0	0	0	0	0	0	23	3,100	6,077
GARLIC	2,130	2,549	5,108	8,983	10,203	7,113	899	1,490	684	295
GERMAN COCKROACH PHEROMONE	0	0	0	0	0	0	0	0	<1	<1
GIBBERELLINS	30,209	21,037	21,249	23,403	23,085	20,363	21,169	19,743	25,363	20,891
GIBBERELLINS, POTASSIUM SALT	3	9	<1	1	1	15	<1	1	<1	<1
GLIOCLADIUM VIRENS GL-21 (SPORES)	0	15	144	156	104	86	60	314	110	48
GLUTAMIC ACID	0	0	0	0	0	0	0	23	3,100	6,077
HYDROGEN PEROXIDE	0	0	0	0	1	15	82	1,754	2,705	2,595
HYDROPRENE	681	5,476	1,131	9,305	1,486	1,609	1,700	1,380	1,656	1,035
IBA	5	8	16	14	38	9	12	18	16	12
LAGENIDIUM GIGANTEUM (CALIFORNIA STRAIN)	87	151	<1	134	859	499	0	1	0	0
LAURYL ALCOHOL	120	580	85	207	111	7,287	486	302	249	243
LINALOOL	114	403	391	358	631	229	196	173	274	280
METARHIZIUM ANISOPLIAE, VAR. ANISOPLIAE, STRAIN ESF1	1	1	<1	3	37	15	18	15	22	<1
METHOPRENE	3,027	8,822	3,213	29,905	1,796	10,285	14,303	2,484	5,121	7,874
METHYL ANTHRANILATE	0	0	6	184	49	57	50	37	85	34
METHYL SALICYLATE	<1	0	0	0	0	0	0	<1	0	0
MUSCALURE	4	4	3	4	2	5	9	4	1	11
MYRISTYL ALCOHOL	25	117	18	42	22	1,502	99	62	51	49
MYROTHECIUM VERRUCARIA, DRIED FERMENTATION SOLIDS & SOLUBLES, STRAIN AARC-0255	0	0	0	1,097	8,496	18,824	20,869	45,917	36,280	47,037
NAA	99	41	18	21	238	14	24	10	6	5
NEROLIDOL	23	32	43	31	24	29	30	12	8	7
NITROGEN, LIQUIFIED	577,181	540,335	423,124	430,214	1,003,749	424,897	391,469	478,466	561,505	319,550
NONANOIC ACID	0	4,250	11,787	14,713	11,729	13,303	12,517	14,890	11,559	7,765
NONANOIC ACID, OTHER RELATED	0	224	620	774	617	700	659	784	608	409
NOSEMA LOCUSTAE SPORES	0	0	0	<1	<1	<1	<1	<1	<1	<1

Table 10A (continued). The reported **pounds** of biopesticides applied in California.

Active Ingredient	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
OIL OF ANISE	<1	0	0	0	0	0	0	<1	<1	<1
OIL OF CEDARWOOD	0	0	0	0	0	0	0	0	0	0
OIL OF CITRONELLA	1	1	0	13	5	11	1	33	0	10
OIL OF LEMONGRASS	1	<1	0	0	0	0	0	0	0	2
OIL OF MUSTARD	<1	<1	0	0	0	0	0	0	0	0
OXYPURINOL	0	0	0	0	0	0	<1	<1	0	0
PAECILOMYCES FUMOSOROSEUS APOPKA STRAIN 97	0	0	0	0	0	0	0	5	0	0
PERFUME	0	0	0	0	<1	<1	<1	<1	<1	<1
POLYHEDRAL OCCLUSION BODIES (OB'S) OF THE NUCLEAR POLYHEDROSIS VIRUS OF HELICOVERPA ZEA (CORN EARWORM)	0	0	0	0	0	0	0	0	0	1
POTASSIUM BICARBONATE	0	0	0	28	65,909	92,990	130,462	121,804	179,676	283,851
PROPYLENE GLYCOL	44,863	54,137	61,455	60,421	67,530	54,281	63,627	58,293	60,369	50,440
PSEUDOMONAS FLUORESCENS, STRAIN A506	<1	206	3,044	3,639	3,660	2,173	103	1,102	1,361	1,972
PSEUDOMONAS SYRINGAE STRAIN ESC-11	0	0	0	0	34	0	0	0	<1	0
PSEUDOMONAS SYRINGAE, STRAIN ESC-10	0	0	15	<1	<1	0	0	0	0	0
PUTRESCENT WHOLE EGG SOLIDS	234	19	7	15	19	136	112	140	168	186
QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	0	0	0	0	0	0	882	7,201	18,869	17,324
S-METHOPRENE	67	77	127	1,806	2,651	409	371	365	863	761
SODIUM BICARBONATE	0	0	0	0	0	5	22	230	2,063	0
SODIUM LAURYL SULFATE	86	21	9	6	14	8	2	9	<1	<1
SOYBEAN OIL	42,462	98,625	25,969	26,656	16,748	59,695	41,901	27,743	31,726	33,006
STREPTOMYCES GRISEOVIRIDIS STRAIN K61	<1	21	1	2	5	2	7	2	1	1
TRICHODERMA HARZIANUM RIFAI STRAIN KRL-AG2	0	0	65	39	60	121	125	116	55	35
XANTHINE	0	0	0	0	0	0	<1	<1	0	0
Z,E-9,12-TETRADECADIEN-1-YL ACETATE	0	0	0	0	0	0	0	0	<1	0
Z,E-9,12-TETRADECADIEN-1-YL ACETATE	0	0	0	0	0	0	0	0	<1	0
Z-11-TETRADECEN-1-YL ACETATE	0	0	0	<1	<1	85	61	9	18	19
Z-8-DODECENOL	4	6	4	7	10	12	16	13	11	20
Z-8-DODECENYL ACETATE	435	659	447	777	888	1,009	1,436	1,127	908	1,737
Z-9-TETRADECEN-1-OL	0	0	0	0	0	0	0	0	<1	0
Grand Total	784,673	835,208	660,410	796,257	1,432,274	982,743	1,036,126	1,022,210	1,118,504	1,037,814

Table 10B. The reported **cumulative acres treated** of biopesticides applied in California . Biopesticides include microorganisms and naturally occurring compounds, or compounds essentially identical to naturally occurring compounds that are not toxic to the target pest (such as pheromones). Use includes primarily agricultural applications. The grand total for acres treated is less than the sum of acres for all active ingredients because some products contain more than one active ingredient. Zero values in early years likely indicate the pesticide was not yet registered for use. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
(E)-4-TRIDECEN-1-YL-ACETATE	70	706	5,428	3,574	2,886	3,132	12,571	9,159	11,739	10,902
(E)-5-DECENOL	0	725	1,434	2,187	1,414	1,034	784	1,316	1,206	1,360
(E)-5-DECENYL ACETATE	0	725	1,434	2,187	1,414	1,034	784	1,316	1,206	1,360
(R,Z)-5-(1-DECENYL) DIHYDRO-2-(3H)-FURANONE	0	0	0	0	1	0	0	0	0	0
(S)-KINOPRENE	55	44	341	179	2,610	888	600	847	869	754
(Z)-11-HEXADECEN-1-YL ACETATE	0	0	0	0	0	0	0	0	1,053	476
(Z)-11-HEXADECENAL	0	0	0	0	0	0	0	0	1,053	476
(Z)-4-TRIDECEN-1-YL-ACETATE	70	706	5,428	3,574	2,886	3,132	12,571	9,159	11,739	10,902
(Z,E)-7,11-HEXADECADIEN-1-YL ACETATE	588	5,535	2,295	279	82	148	171	128	87	38
(Z,Z)-7,11-HEXADECADIEN-1-YL ACETATE	588	2,120	2,295	279	82	148	171	128	87	38
1-DECANOL	0	0	0	0	0	0	0	0	0	0
1-METHYLCYCLOPROPENE	0	0	0	0	0	0	0	3	<1	9
1-NAPHTHALENEACETAMIDE	695	812	1,784	1,820	5,211	5,418	4,135	3,690	1,705	2,355
ACETIC ACID	23	0	0	0	0	0	0	0	0	734
AGROBACTERIUM RADIOBACTER	2,517	2,110	6,048	1,284	5,954	1,517	1,072	514	500	365
AGROBACTERIUM RADIOBACTER, STRAIN K1026	0	0	0	0	0	0	4	325	355	716
ALLYL ISOTHIOCYANATE	0	0	0	2	0	0	0	1	0	36
AMINO ETHOXY VINYL GLYCINE HYDROCHLORIDE	0	0	0	0	75	142	1	6	10	0
AMPELOMYCES QUISQUALIS	0	366	4,566	18,628	15,039	8,363	7,156	2,193	540	332
AZADIRACHTIN	5,630	51,215	76,386	70,086	64,239	103,078	71,362	73,876	92,133	79,478
BACILLUS PUMILUS, STRAIN QST 2808	0	0	0	0	0	0	0	0	0	1
BACILLUS SPHAERICUS, SEROTYPE H-5A5B, STRAIN 2362	0	0	0	104	84	39	0	0	0	0
BACILLUS SUBTILIS GB03	0	0	0	0	0	0	0	0	0	0
BACILLUS THURINGIENSIS (BERLINER)	18,412	12,305	8,368	6,286	4,437	5,561	3,345	16,813	2,738	2
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, GC-91 PROTEIN	42,378	108,867	137,786	146,197	82,473	60,262	74,282	71,531	73,888	90,285
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	46,069	68,505	84,793	109,951	86,430	85,564	65,923	41,378	45,129	54,037
BACILLUS THURINGIENSIS (BERLINER), SUBSP. ISRAELENSIS, SEROTYPE H-14	1,761	738	3,357	4,289	5,242	3,221	2,434	1,964	4,907	14,525
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI STRAIN SA-12	0	0	0	0	0	0	9,474	11,773	43,337	54,540
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, SEROTYPE 3A,3B	400,394	574,228	435,707	486,699	342,525	249,709	245,114	141,868	56,866	67,211
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN EG 2348	16,675	27,972	22,742	11,590	22,097	9,280	11,891	5,818	8,214	384

Table 10B (continued). The reported **cumulative acres treated** in California with each biopesticide.

Active Ingredient	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN EG2371	56,536	62,435	32,471	19,739	11,015	1,684	845	439	134	338
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11	104,848	134,225	139,051	175,772	161,858	152,834	143,643	174,400	180,617	158,413
BACILLUS THURINGIENSIS (BERLINER), SUBSP. SAN DIEGO	3	0	4	100	6	20	18	7	2	3
BACILLUS THURINGIENSIS SUBSPECIES KURSTAKI STRAIN BMP 123	0	0	0	0	87	7	687	1,913	6,279	3,013
BACILLUS THURINGIENSIS SUBSPECIES KURSTAKI, GENETICALLY ENGINEERED STRAIN EG7841 LEPIDOPTERAN ACTIVE TOXIN	0	0	1,377	87,123	81,541	83,094	118,598	55,515	5,061	8,479
BACILLUS THURINGIENSIS VAR. KURSTAKI STRAIN M-200	0	0	0	0	0	0	2	0	0	1
BACILLUS THURINGIENSIS VAR. KURSTAKI, GENETICALLY ENGINEERED STRAIN EG7826	0	0	0	0	0	0	30,603	76,935	2,571	8,493
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	0	0	0	0	0	0	0	0	0	34,164
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN SD-1372, LEPIDOPTERAN ACTIVE TOXIN(S)	0	0	0	0	0	32	1,561	4,718	10,656	4,989
BACILLUS THURINGIENSIS, SUBSP. ISRAELENSIS, STRAIN AM 65-52	0	0	0	0	0	0	0	0	5	1
BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES	0	0	0	0	0	0	0	0	1,310	924
BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN HD-1	0	0	24	2,718	202,653	217,136	199,377	170,574	138,223	124,389
BACILLUS THURINGIENSIS, VAR. KURSTAKI DELTA ENDOTOXINS CRY 1A(C) AND CRY 1C (GENETICALLY ENGINEERED) ENCAPSULATED IN PSEUDOMONAS FLUORESCENS (KILLED)	0	0	6,387	43,741	23,196	14,779	14,698	4,622	546	111
BEAUVERIA BASSIANA STRAIN GHA	0	0	3	1,459	2,991	25,510	3,399	2,853	3,673	2,887
CANDIDA OLEOPHILA ISOLATE I-182	0	0	0	0	0	0	0	0	0	0
CANOLA OIL	0	0	0	0	0	0	2	2	2	2
CAPSICUM OLEORESIN	1,055	1,048	582	443	2,762	1,799	261	254	149	318
CASTOR OIL	0	0	0	<1	0	<1	1	0	0	0
CINNAMALDEHYDE	0	0	0	<1	<1	2,418	4,136	1,534	295	105
CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	0	0	7,526	13,537	22,092	45,247	49,142	36,602	34,133	38,314
CODLING MOTH GRANULOSIS VIRUS	0	448	0	0	0	0	0	0	0	0
CONIOTHYRIUM MINITANS STRAIN CON/M/91-08	0	0	0	0	0	0	0	0	935	1,352
CYTOKININ	0	0	0	0	82	0	3	0	0	0
DIHYDRO-5-HEPTYL-2(3H)-FURANONE	0	0	0	20	0	0	0	0	0	0
DIHYDRO-5-PENTYL-2(3H)-FURANONE	0	0	0	20	0	0	0	0	0	0
E,E-8,10-DODECADIEN-1-OL	3,001	3,880	3,811	3,696	4,300	4,514	10,407	10,381	11,841	21,217
E-11-TETRADECEN-1-YL ACETATE	0	0	0	13	2,171	54,460	38,834	14,063	16,870	10,335
E-8-DODECENYL ACETATE	4,539	3,870	6,045	9,932	11,791	23,549	22,721	33,383	33,602	39,198

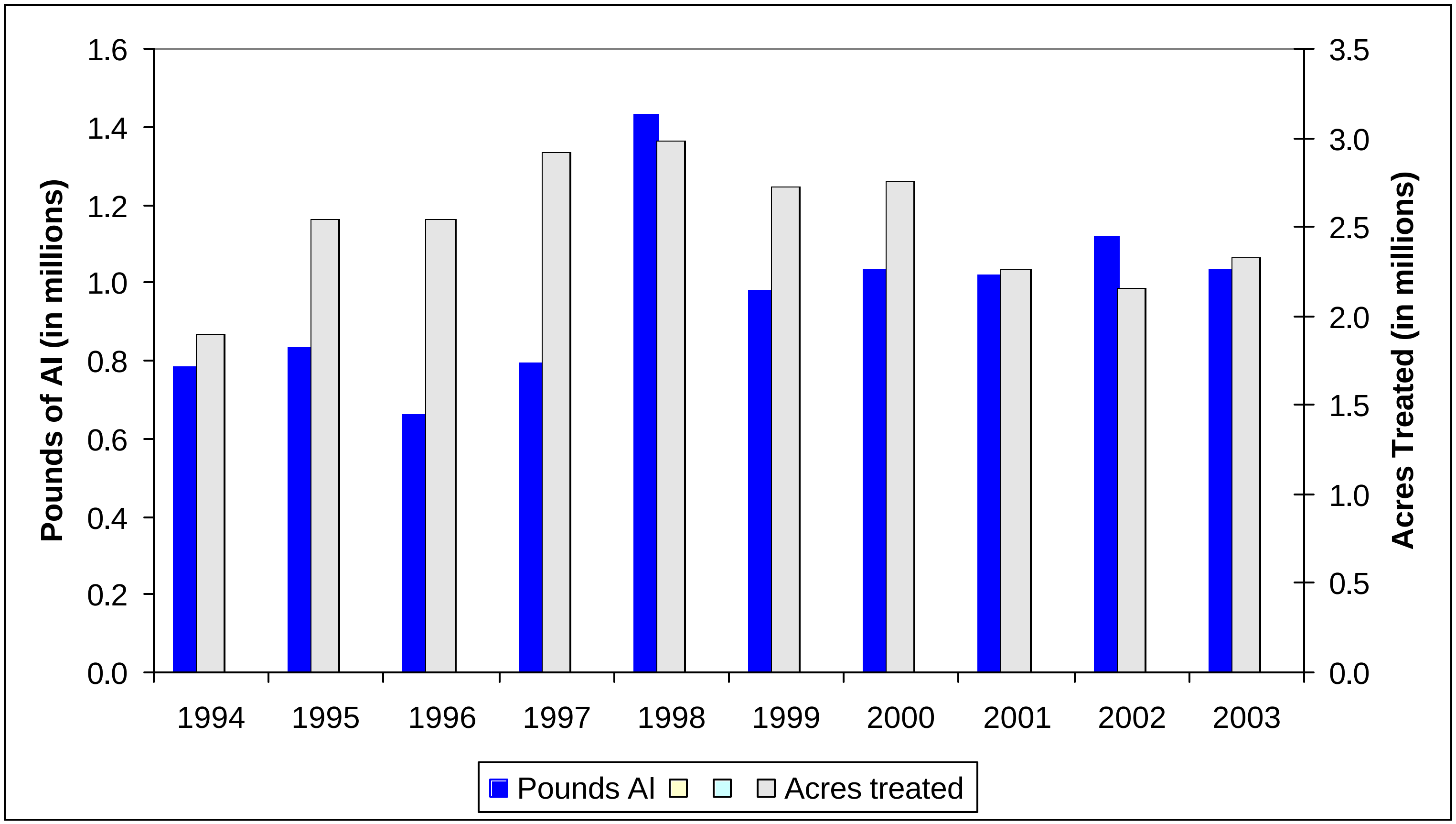
Table 10B (continued). The reported **cumulative acres treated** in California with each biopesticide.

Active Ingredient	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
ENCAPSULATED DELTA ENDOTOXIN OF BACILLUS THURINGIENSIS VAR. KURSTAKI IN KILLED PSEUDOMONAS FLUORESCENS	34,056	35,755	69,222	96,678	83,238	59,905	32,372	15,188	7,525	1,160
ENCAPSULATED DELTA ENDOTOXIN OF BACILLUS THURINGIENSIS VAR. SAN DIEGO IN KILLED PSEUDOMONAS FLUORESCENS	0	4	1	0	19	7	6	4	<1	0
ESSENTIAL OILS	10	0	0	0	0	0	6	268	0	0
ETHYLENE	0	0	0	0	0	2	0	0	0	0
EUGENOL	0	0	0	0	1	0	0	0	0	0
FARNESOL	15,121	17,721	22,113	16,837	12,543	43,212	25,673	8,495	6,584	5,451
GAMMA AMINOBUTYRIC ACID	0	0	0	0	0	0	0	320	43,652	87,153
GARLIC	4,763	3,976	6,586	24,333	12,403	7,376	4,725	2,407	2,756	828
GERMAN COCKROACH PHEROMONE	0	0	0	0	0	0	0	0	0	0
GIBBERELLINS	414,837	440,001	416,073	455,572	487,195	439,529	464,750	387,488	423,330	430,988
GIBBERELLINS, POTASSIUM SALT	479	903	101	184	70	1,429	8	188	22	59
GLIOCLADIUM VIRENS GL-21 (SPORES)	0	1	21	14	29	12	8	768	6	0
GLUTAMIC ACID	0	0	0	0	0	0	0	320	43,652	87,153
HYDROGEN PEROXIDE	0	0	0	0	0	5	21	485	633	802
HYDROPRENE	0	0	0	0	1	1	<1	1	0	0
IBA	187	139	104	410	1,319	1,236	266	124	244	232
LAGENIDIUM GIGANTEUM (CALIFORNIA STRAIN)	0	0	<1	0	0	0	0	0	0	0
LAURYL ALCOHOL	2,807	3,028	1,798	2,858	2,886	2,666	8,038	6,429	4,635	4,791
LINALOOL	0	0	0	0	0	0	0	0	0	0
METARHIZIUM ANISOPLIAE, VAR. ANISOPLIAE, STRAIN ESF1	0	0	0	0	0	0	0	0	0	0
METHOPRENE	35	86	65	11	23	58	38	50	0	359
METHYL ANTHRANILATE	0	0	0	0	0	0	0	0	81	56
METHYL SALICYLATE	0	0	0	0	0	0	0	0	0	0
MUSCALURE	361	794	1,439	699	979	292	435	189	121	2,283
MYRISTYL ALCOHOL	2,807	3,028	1,798	2,858	2,886	2,666	8,038	6,429	4,635	4,791
MYROTHECIUM VERRUCARIA, DRIED FERMENTATION SOLIDS & SOLUBLES, STRAIN AARC-0255	0	0	0	104	1,514	3,348	3,173	4,392	3,926	4,390
NAA	28	33	41	364	542	788	172	102	72	75
NEROLIDOL	15,121	17,721	22,113	16,837	12,543	43,212	25,673	8,495	6,584	5,451
NITROGEN, LIQUIFIED	0	0	0	0	0	0	0	0	0	0
NONANOIC ACID	0	674	518	294	645	573	496	495	443	446
NONANOIC ACID, OTHER RELATED	0	674	518	294	645	573	496	495	443	446
NOSEMA LOCUSTAE SPORES	0	0	0	0	7	14	2	9	0	35

Table 10B (continued). The reported **cumulative acres treated** in California with each biopesticide.

Active Ingredient	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
OIL OF ANISE	0	0	0	0	0	0	0	0	0	0
OIL OF CEDARWOOD	0	0	0	0	0	0	0	0	0	0
OIL OF CITRONELLA	0	0	0	6	80	24	1	0	0	0
OIL OF LEMONGRASS	0	0	0	0	0	0	0	0	0	36
OIL OF MUSTARD	0	0	0	0	0	0	0	0	0	0
OXYPURINOL	0	0	0	0	0	0	0	0	0	0
PAECILOMYCES FUMOSOROSEUS APOPKA STRAIN 97	0	0	0	0	0	0	0	13	0	0
PERFUME	0	0	0	0	0	0	70	0	0	0
POLYHEDRAL OCCLUSION BODIES (OB'S) OF THE NUCLEAR POLYHEDROSIS VIRUS OF HELICOVERPA ZEA (CORN EARWORM)	0	0	0	0	0	0	0	0	0	293
POTASSIUM BICARBONATE	0	0	0	11	34,010	52,110	60,330	52,654	73,894	106,955
PROPYLENE GLYCOL	662,069	901,000	1,008,762	1,053,200	1,147,506	924,156	998,115	780,442	726,172	763,911
PSEUDOMONAS FLUORESCENS, STRAIN A506	8	990	16,951	26,617	29,656	15,760	1,443	11,668	13,126	16,945
PSEUDOMONAS SYRINGAE STRAIN ESC-11	0	0	0	0	17	0	0	0	0	0
PSEUDOMONAS SYRINGAE, STRAIN ESC-10	0	0	0	0	0	0	0	0	0	0
PUTRESCENT WHOLE EGG SOLIDS	1,047	68	0	0	0	0	0	0	0	0
QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	0	0	0	0	0	0	2,154	15,205	40,573	54,553
S-METHOPRENE	0	0	0	0	505	<1	567	951	166	21
SODIUM BICARBONATE	0	0	0	0	0	8	0	0	0	0
SODIUM LAURYL SULFATE	0	<1	0	0	48	0	16	0	29	0
SOYBEAN OIL	64,450	86,291	16,839	22,476	10,427	13,609	12,837	11,254	18,627	15,359
STREPTOMYCES GRISEOVIRIDIS STRAIN K61	<1	13	20	115	34	27	83	50	17	14
TRICHODERMA HARZIANUM RIFAI STRAIN KRL-AG2	0	0	<1	69	369	456	885	1,048	293	466
XANTHINE	0	0	0	0	0	0	0	0	0	0
Z,E-9,12-TETRADECADIEN-1-YL ACETATE	0	0	0	0	0	0	0	0	13	0
Z-11-TETRADECEN-1-YL ACETATE	0	0	0	13	2,171	54,460	38,834	14,063	16,870	10,335
Z-8-DODECENOL	4,539	3,870	6,045	9,932	11,791	23,549	22,721	33,383	33,602	39,198
Z-8-DODECENYL ACETATE	4,539	3,870	6,045	9,932	11,791	23,549	22,721	33,383	33,602	39,198
Z-9-TETRADECEN-1-OL	0	0	0	0	0	0	0	0	13	0
Grand Total	1,902,581	2,548,349	2,547,048	2,919,080	2,989,986	2,727,563	2,757,736	2,265,533	2,154,413	2,328,345

Figure 8. Use trends of biopesticides. Biopesticides include microorganisms and naturally occurring compounds, or compounds essentially identical to naturally occurring compounds that are not toxic to the target pest (such as pheromones). Reported pounds of active ingredient (AI) applied includes both agricultural and reportable nonagricultural applications. The reported cumulative acres treated includes primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.



V. TRENDS IN PESTICIDE USE IN CERTAIN COMMODITIES

This summary describes possible reasons for changes in pesticide use from 2002 to 2003 for the following commodities: (1) cotton, (2) wine grapes, (3) table and raisin grapes, (4) almonds, (5) alfalfa, (6) processing tomato, (7) rice, (8) oranges, (9) head lettuce, (10) peaches and nectarines, (11) strawberry, and (12) carrots. These 12 commodities were chosen because they were treated with more than 2 million pounds of active ingredients (AI) or cumulatively treated on more than 5 million acres.

Information used to develop this section was drawn from several publications and phone interviews with pest control advisors, growers, University of California Cooperative Extension farm advisors and specialists, researchers, and commodity association representatives. The information collected was analyzed by DPR staff, using their extensive knowledge of pesticides, California agriculture, and pest management practices to draw conclusions about possible reasons for changes in pesticide use. Thus these explanations are based on anecdotal information, not rigorous statistical analyses.

Reported pesticide use in California in 2003 totaled 175 million pounds, an increase of 7.2 million pounds from 2002 (4.3% increase). The active ingredients with the largest uses by pounds were sulfur, petroleum oils, metam-sodium, and methyl bromide. Sulfur use decreased by 46,000 pounds (-0.1%) and was the most highly used pesticide in 2003, both in pounds applied and acres treated. By pounds, sulfur accounted for 30% of all reported pesticide use. Sulfur is a natural fungicide favored by both conventional and organic farmers. Petroleum oil use decreased by 209,000 pounds (-1.2%), metam sodium use decreased by 322,000 pounds (-2.1%), and methyl bromide use increased by 834,000 pounds (13%).

DPR data analyses have shown that pesticide use varies from year to year depending upon pest problems, weather, acreage and types of crops planted, economics, and other factors. For most of the 12 crops investigated, pest problems, especially diseases, were higher in 2003 than in 2002 in several areas due to the wet and cool spring in 2003. There was a dramatic increase in the use of some newer, reduced-risk pesticides such as indoxacarb, spinosad, azoxystrobin, tebufenozide, and acetamiprid. Prices for most of the 12 crops improved in 2003, which may have also been an incentive to use more pesticides to protect valuable crops. However, acreage of most of the 12 crops decreased.

Sulfur was used mostly to control powdery mildew on grapes; use decreased from 2002 to 2003 because of better understanding of powdery mildew control and increased use of some newer, reduced-risk fungicides. The fumigant 1,3-dichloropropene (1,3-D) had the largest increase in pounds mostly on almonds, strawberries, and carrots.

Different pesticides are used at different rates. In California, most pesticides are applied at rates of around 1 to 2 pounds per acre. However, fumigants are usually applied at rates of hundreds of pounds per acre. Thus, comparing use by pounds will emphasize fumigants. Comparing use among different pesticides using acres treated gives a different picture.

By acres treated, the pesticides with the greatest use in 2003, after sulfur, were glyphosate, oxyfluorfen, chlorpyrifos, and paraquat dichloride, all herbicides except for chlorpyrifos. Glyphosate was used mostly on rights-of-way, almond, cotton, and wine grapes. Glyphosate use on all these sites, except for wine grapes, increased from 2002 to 2003, because of a trend toward more use of postemergence herbicides and because it is less costly than other herbicides. On cotton, glyphosate use also increased because of increased acreage of varieties genetically engineered to be tolerant to glyphosate. Oxyfluorfen is often applied with glyphosate.

Most of the increase in total acres treated was from increased use of chlorpyrifos and indoxacarb, both insecticides. Chlorpyrifos use increased mostly on alfalfa, cotton, and almonds, and indoxacarb use increased mostly on cotton and alfalfa. Use increased on all these crops because of increased insect pressures. Chlorpyrifos has traditionally been used in the dormant season on orchards but this practice is declining because of concern about its appearance in surface water. The increased use of chlorpyrifos in 2003 was from increased use during the summer months.

Use is given by pounds of active ingredient applied and by acres treated. Acres treated means the cumulative number of acres treated; the acres treated in each application are summed even when the same field is sprayed more than once in a year. (For example, if one acre is treated three times in a season with an individual active ingredient, it is counted as three acres treated).

Cotton

Cotton is grown for fiber, oil, and animal feed and is one of the most widely grown crops in California. Cotton acres planted remained about the same from 2002 to 2003, increasing only slightly by 1 percent. Two main kinds of cotton are grown: upland and Pima. Most cotton acreage is in upland cotton, and its acreage increased from 2002 to 2003. Pima acreage decreased from 2002 to 2003. Most cotton is grown in the southern San Joaquin Valley, but a small percentage is grown in Imperial and Riverside counties and several counties in the Sacramento Valley.

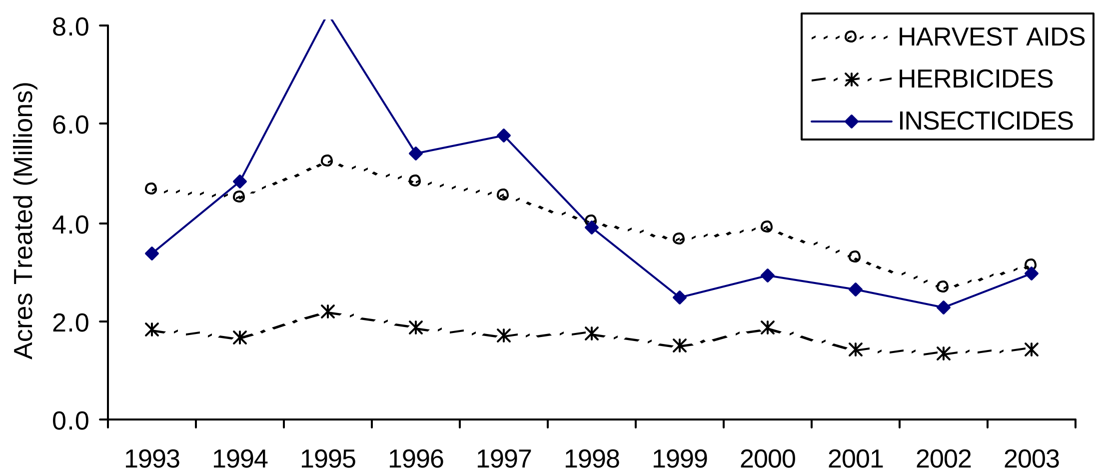
Table 11A. Total reported pounds of all active ingredients (AIs), acres treated, acres planted, and prices for cotton each year from 1998 to 2003. Planted acres in 1998 to 2001 are from the California Department of Food and Agriculture (CDFA), 2002; planted acres in 2002 and 2003 are from California Field Crop Review, California Agricultural Statistics Service (CASS), January 2004; all marketing year average prices are from National Agricultural Statistics Service (NASS), July 2004.

	1999	2000	2001	2002	2003
Lbs AI	8,526,378	9,359,879	8,127,020	7,157,764	7,141,281
Acres Treated	10,178,518	11,708,728	9,676,609	8,352,686	10,529,041
Acres Planted Upland Cotton	610,000	775,000	630,000	480,000	550,000
Acres Planted Pima Cotton	240,000	145,000	240,000	210,000	150,000
Acres Planted Total	850,000	920,000	870,000	690,000	700,000
Price Upland $/lbs	$0.58	$0.52	$0.44	$0.57	$0.77
Price Pima $/lbs	$0.82	$1.01	$0.94	$0.86	$1.16

Table 11B. Percent difference from previous year for reported pounds of all AIs, acres treated, acres planted, and prices for cotton from 1999 to 2003.

	1999	2000	2001	2002	2003
Lbs AI	-11	10	-13	-12	0
Acres Treated	-21	15	-17	-14	26
Acres Planted Upland Cotton	-6	27	-19	-24	15
Acres Planted Pima Cotton	20	-40	66	-13	-29
Acres Planted Total	0	8	-5	-21	1
Price Upland $/lbs	-15	-10	-16	32	35
Price Pima $/lbs	-11	24	-7	-9	35

Figure 9. Acres of cotton treated by all AIs in the major types of pesticides from 1993 to 2003.



Although cotton acreage was nearly the same in 2003 as in 2002, total acres treated with all pesticides increased by 26 percent. Acres treated with insecticides and harvest aids increased; however, acres treated with herbicides remained about the same. Acres treated increased in all San Joaquin Valley counties and Riverside County and decreased in the Sacramento Valley and Imperial County.

Although acres treated increased, total pounds applied decreased by 1 percent from 2002 to 2003. The decrease in pounds was mostly from decreases in sodium chlorate, metam-sodium, and oils, which are all used at high rates which explains how acres could increase while pounds decreased. Most other major AIs increased by pounds applied.

By acres treated, the major insecticides in cotton in 2003 were indoxacarb, avermectin, chlorpyrifos, acetamiprid, and aldicarb; the major herbicides were glyphosate, trifluralin, oxyfluorfen, pyrithiobac-sodium, and pendimethalin; the major plant growth regulator was mepiquat dichloride; and the major harvest aids used were paraquat dichloride, ethephon, diuron, thidiazuron (diuron and thidiazuron are mostly applied together), and sodium chlorate. The use of most pesticides increased in 2003 from levels in 2002. Some of the major exceptions were decreases in pendimethalin, MSMA, bromoxynil, cyclanilide, and naled.

In 2003, weather conditions for cotton production were generally good, except for warm nighttime temperatures in late July and early August, and pest levels were moderate. The following comments on pest activity and treatment apply mostly to the San Joaquin Valley production area. Early season thrips and Lepidopteran pests were a bigger problem than normal in many areas. Lygus populations were fairly high through May then generally declined in many areas to levels lower than in some recent years. Aphids were a problem in several areas, and though there were no major, continuing outbreaks, many growers treated for them to prevent sticky cotton during harvest. Sticky cotton occurs when high populations of aphids and/or silverleaf whiteflies produce sugary excretions, which drop on the cotton lint. The presence of sticky cotton at levels that impact end use of cotton lint can have a large impact on lint price and acceptability for some uses. Late season whiteflies were a problem in some counties as well. Beet armyworms were widespread, sometimes requiring multiple treatments. Levels of armyworm damage in the first half of the summer were unusually high in several areas of the San Joaquin Valley. Spider mites were a slightly bigger problem in 2003 than 2002.

Total insecticide use by acres treated has been decreasing in 1990s but increased by 39 percent from 2002 to 2003, and use of most of the major insecticides increased from 2002 to 2003. Major insecticides with the largest percent increase in acres treated were spinosad, *Bacillus thuringiensis* (Bt), acetamiprid, tebufenozide, and indoxacarb, all low risk pesticides. Most of these pesticides (all except for acetamiprid) were used primarily to control beet armyworm and other lepidopteran pests, which were a bigger problem in 2003 than usual. Acetamiprid was used to control aphids and whiteflies which have been a major concern in recent years because of the need to prevent sticky cotton. Indoxacarb and acetamiprid were also used some to control lygus bugs. Avermectin, the second most used insecticide, was used for spider mite control. Chlorpyrifos was used mostly to control aphids. Major insecticides with the largest decreases were carbofuran, naled, pyriproxyfen and endosulfan, which are used mostly to control aphids or whiteflies.

Herbicide use fluctuated from year to year between –22% to +30% throughout the 1990s; it increased by 7 percent from 2002 to 2003. Glyphosate accounts for most of this increase. Its use was highest in 1995 and 2001 and, though its use in 2003 was not as high as in those two years, it increased by 18 percent from 2002 to 2003. It has become the most widely used herbicide in cotton production in recent years, used on more than twice as many acres from 2001 to 2003 as trifluralin, the next most widely-used herbicide.

The herbicide glyphosate is effective against many annual and perennial weeds that occur in California cotton fields. It can be used as an early over-the-top herbicide with Roundup-Ready cotton varieties (which are genetically engineered to be resistant to the herbicide glyphosate), or with hooded sprayers for a longer application window. Although it does not offer complete control, it can be an effective material for use in managing annual morningglory, nutsedge, and field bindweed, which continue to be problem weeds affecting an expanding acreage. It can be used as a harvest aid, particularly when late season weeds are also a problem; however, this use has been quite limited to date. It has replaced some other herbicides because of increased acreage of Roundup-Ready cotton. Roundup-Ready cotton acreage increased from 175,000 in 2002 to 220,000 in 2003. Roundup-Ready varieties were not planted as extensively prior to about 2001 in the San Joaquin Valley because the varieties initially available were either lower in yield potential or had reduced fiber quality in some cases. Adoption of Roundup-Ready varieties is also influenced by whether growers have weed problems suitable for control with glyphosate and returns that make the technology fee for use of these varieties cost-effective. University of

California and other researchers continue to point out potential for cotton to develop resistance to glyphosate as well as to other herbicides, emphasizing that growers should not rely on single herbicide systems.

About 15 percent of the acreage was genetically engineered Buctril-resisant cotton. However, Buctril (bromoxynil, another herbicide) use decreased by 46 percent from 2002 to 2003 and by 83 percent from 2000 to 2003. Lower fiber quality in some varieties and lower yield performance in other available Buctril-resistant cotton varieties likely had an impact on grower adoption of this technology.

Oxyfluorfen use increased because it is one of the few herbicides that can be used at layby. The other layby herbicides are cyanazine, which is no longer registered, and prometryn.

Use of defoliants as harvest aids decreased nearly every year from 1995 to 2002; however, use by acres treated increased by 17 percent from 2002 to 2003. Use of nearly all defoliants increased from 2002 to 2003 except for cyclanilide and sodium cacodylate/cacodylic acid. Acres treated with sodium chlorate were nearly the same in 2002 and 2003, but total pounds used decreased. Use of the plant growth regulator (also a harvest aid) mepiquat chloride, which is used mid-season for vegetative growth management, had an exceptionally large increase (over 70 percent) from 2002 to 2003. The use of and perceived need for plant growth regulators such as mepiquat chloride is strongly influenced by both weather conditions and early insect problems that cause fruit loss, both of which can affect relative levels of vegetative growth versus fruit retention and growth. Environmental and plant conditions in 2003 were mixed. Some crops could not be planted until later than usual. These late crops tended to have more vegetative growth late in the season making it more difficult to defoliate the plants before harvest. Thus, growers had to treat these fields several times with defoliants. This also explains the increased use of mepiquat chloride, which is a plant growth regulator that causes the plant to divert its energy from vegetative production to fruit (cotton boll) production. In contrast, use of cacodylic acid, another harvest aid, decreased probably because some buyers of raw Pima cotton were concerned that residues of an arsenical like cacodylic acid might appear in cotton fiber residue tests.

Wine grapes

California has four major wine grape production regions: 1) North Coast (Lake, Mendocino, Napa, and Sonoma counties); 2) Central Coast (Alameda, Monterey, San Luis Obispo, Santa Barbara, San Benito, Santa Cruz, and Santa Clara counties); 3) Northern San Joaquin Valley (San Joaquin, Calaveras, Amador, Sacramento, Merced, Stanislaus, and Yolo counties); and 4) Southern San Joaquin Valley (Fresno, Kings, Tulare, Kern, and Madera counties). Each region has distinct climatic and geologic characteristics that lead to different pest types and pressures and cultural and pest management practices. From 2002 to 2003, acreage and grape prices decreased somewhat, 5 percent and 1 percent respectively.

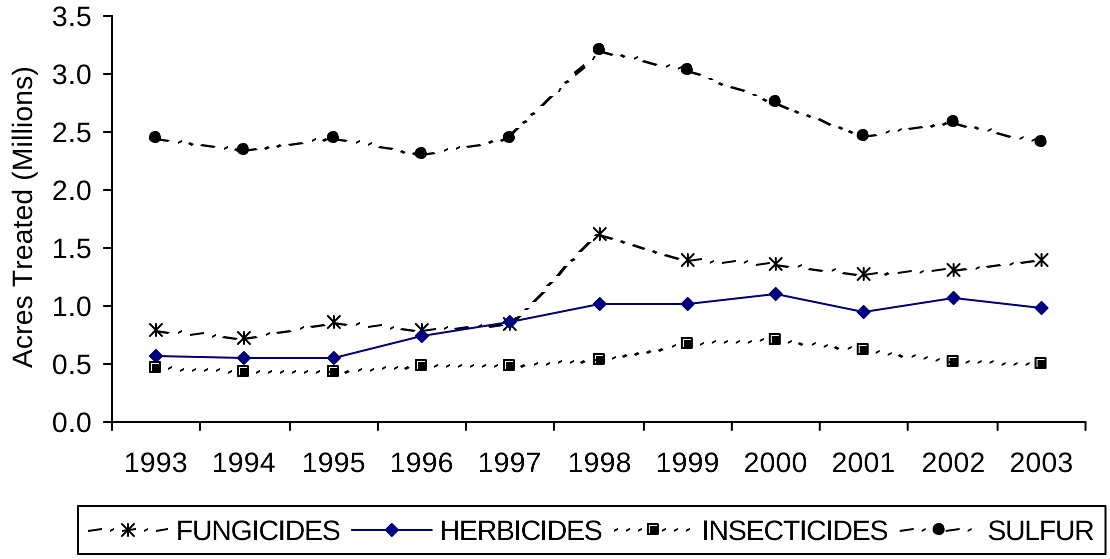
Table 12A. Total reported pounds of all AIs, acres treated, acres planted, and prices for wine grapes each year from 1998 to 2003. Planted acres in 1998 to 2000 are from CDFA, 2002; planted acres in 2001 to 2003 are from California Grape Acreage 2003, CASS, June 2004; all marketing year average prices are from NASS, July 2004.

	1999	2000	2001	2002	2003
Lbs AI	30,661,224	27,615,039	22,780,014	24,110,818	23,463,989
Acres Treated	7,209,484	6,995,305	6,450,639	6,662,141	6,641,695
Acres Planted	554,000	568,000	570,000	556,000	529,000
Price $/ton	$585.00	$567.00	$597.00	$535.00	$530.00

Table 12B. Percent difference from previous year for reported pounds of all AIs, acres treated, acres planted, and prices for wine grapes from 1999 to 2003.

	1999	2000	2001	2002	2003
Lbs AI	-11	-10	-18	6	-3
Acres Treated	-3	-3	-8	3	0
Acres Planted	9	3	0	-2	-5
Price $/ton	1	-3	5	-10	-1

Figure 10. Acres of wine grapes treated by all active ingredients in the major types of pesticides from 1993 to 2003.



Total pesticide use and the use of fungicides, herbicides, and insecticides on wine grapes have remained fairly steady in the last few years. Major pesticides with the largest percentage increases in acres treated include buprofezin, oryzalin, copper oxide, copper oxychloride sulfate, and bifenazate. Those with the largest decreases include diuron, avermectin, petroleum distillates, Bt, lime sulfur, and azoxystrobin. In 2003, factors influencing the small pesticide use changes included pest pressure (which varied by region), competition from newer products, pressure from wineries to eliminate use of some products (buyer restrictions), efforts by growers to reduce costs, and continued increasing emphasis on sustainable farming.

The major fungicides by acres treated in wine grapes in 2003 were sulfur, myclobutanil, copper hydroxide, trifloxystrobin, tebuconazole, fenarimol, triflumizole, and kresoxim-methyl. The major insecticides and miticides were imidacloprid, tebufenozide, Bt, petroleum distillates, pyridaben, fenpropathrin, and bifenazate. The major herbicides were glyphosate, oxyfluorfen, paraquat dichloride, simazine, oryzalin, and diuron.

Most fungicide use was for control of powdery mildew. Sulfur use declined 6 percent but use of most other fungicides increased from 2002 to 2003. Several reasons contribute to the fluctuation in fungicide use between the 2002 and 2003 seasons. Lower cost is an important reason for the increased use of fenarimol and newer materials such as tebuconazole and trifloxystrobin.

In the southern San Joaquin Valley, the 2003 season was difficult due to the cool spring weather that caused excessive berry set in certain varieties leading to tight bunches prone to bunch rot. The late in-season precipitation, which also promotes bunch rot, further explains the increase in use of copper-based and other fungicides labeled for bunch rot control. In other regions, the abnormally wet spring weather caused greater than normal potential for disease problems. Reasons for the decreased use of certain fungicides used for powdery mildew include a better understanding of fungicide efficacy, resistance management, and powdery mildew phenology models that optimize application timing and use. The increased use of both trifloxystrobin and kresoxim-methyl for powdery mildew control explains the decreased use of azoxystrobin. Additionally, efforts by growers to reduce costs, pressure from wineries to eliminate use of some products, lower pest pressure over seasons, and competition from other products further explain fluctuations in use from year to year.

Insecticide and miticide use decreased slightly from 2002 to 2003 due mainly to reduced pest pressure from worms and mites. However, the use of Bt, petroleum distillates, fenpropathrin, bifenazate, and pyridaben increased significantly. Economic considerations and market competition from newer products (such as tebufenozide and bifenazate) contributed to the decreased use of several of the top insecticides and miticides (such as imidacloprid, avermectin, and cryolite). Growers' increasing emphasis on sustainable farming practices was another major factor accounting for decreased uses. Buyer restrictions also contributed to use reductions in certain products such as cryolite and propargite. Some of the largest decreases in use were for propargite and avermectin (for spider mites); cryolite (for omnivorous leafroller); dimethoate (for leafhoppers and sharpshooters); and methomyl (for leafhoppers, spider mites, and omnivorous leafroller). Propargite use (for spider mites) decreased mainly due to competition from newer miticides, its long re-entry interval, restrictions from wineries, and cost.

Herbicide use decreased slightly from 2002 to 2003. The use of all herbicides decreased with the exception of oryzalin, paraquat, and sethoxydim. The decrease in use of soil-applied herbicides such as simazine and diuron is explained, in part, by the efforts of growers to minimize the potential for off-site movement to ground and surface water, and by regulatory restrictions. This decrease is also related to the incompatibility of these herbicides with drip irrigation systems, the use of which is increasing. The increased use of paraquat, a foliar-applied herbicide, is partially due to growers' efforts to use foliar-applied herbicides as alternatives to glyphosate where its extensive use has altered the weed spectrum by selecting weed species with lower susceptibility to glyphosate.

Table grapes and raisins

Production of table grapes is largely centered in the southern San Joaquin Valley region (85 percent), although a significant portion of production (14 percent) comes from the Coachella

Valley region. The southern San Joaquin Valley region includes Fresno, Madera, Tulare, Kern, and Kings counties; the Coachella Valley region includes the Coachella regions of Riverside, Imperial, and San Bernardino counties. The remaining regions account for less than 1 percent of the state's production. Almost all production (99 percent) of raisin grapes is in the Southern San Joaquin Valley region; the remaining 1 percent is in the northern San Joaquin Valley region (San Joaquin, Calaveras, Amador, Sacramento, Merced, and Stanislaus counties).

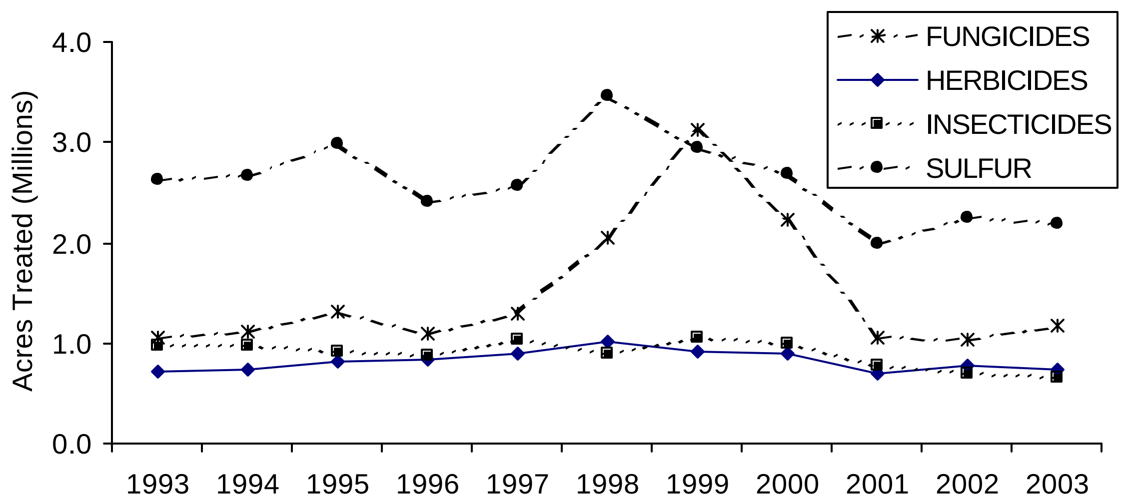
Table 13A. Total reported pounds of all active ingredients, acres treated, acres planted, and prices for raisin and table grapes each year from 1998 to 2003. Planted acres in 1998 to 2000 are from CDFA, 2002; planted acres in 2001 to 2003 are from California Grape acreage 2003, CASS, June 2004; all marketing year average prices are from NASS, July 2004.

	1999	2000	2001	2002	2003
Lbs AI	29,469,669	26,769,275	19,638,908	22,161,905	21,525,557
Acres Treated	9,458,039	8,145,603	5,670,936	5,902,602	5,952,517
Acres Planted Raisin	286,000	287,000	283,000	279,000	260,000
Acres Planted Table	100,000	100,000	98,000	97,000	93,000
Price Raisin $/ton	$321.00	$166.00	$186.00	$152.00	$163.00
Price Table $/ton	$552.00	$565.00	$610.00	$616.00	$601.00

Table 13B. Percent difference from previous year for reported pounds of all AIs, acres treated, acres planted, and prices for raisin and table grapes from 1999 to 2003.

	1999	2000	2001	2002	2003
Lbs AI	-16	-9	-27	13	-3
Acres Treated	5	-14	-30	4	1
Acres Planted Raisin	2	0	-1	-1	-7
Acres Planted Table	2	0	-2	-1	-4
Price Raisin $/ton	10	-48	12	-18	7
Price Table $/ton	11	2	8	1	-2

Figure 11. Acres treated in table and raisin grapes by all AIs in the major types of pesticides from 1993 to 2003.



Pesticide use in table and raisin grapes declined from 1998 to 2001, but increased somewhat from 2001 to 2003. Most of these changes were due to high fungicide use from 1998 to 2000.

From 2002 to 2003 insecticide and herbicide use decreased by 6% but fungicide use increased by 2%. Pesticides with large percent increases in use include buprofezin, glufosinate-ammonium, potash soap, copper oxychloride, *Bacillus subtilis*, and oryzalin. Those with large percent decreases in use include azoxystrobin, pendimethalin, strychnine, sodium tetrathiocarbonate, and pyridaben.

The major insecticides and miticides by acres treated in table and raisin grapes in 2003 were cryolite, imidacloprid, Bt. tebufenozide, and propargite; the major herbicides were glyphosate, paraquat, simazine, oxyfluorfen, and diuron; and the major fungicides were sulfur, myclobutanil, copper hydroxide, tebuconazole, and trifloxystrobin.

Powdery mildew is the number one grapevine disease and accounts for the majority of fungicide use in San Joaquin Valley and Coachella Valley vineyards. Other diseases that growers manage using fungicides are Botrytis bunch rot and Phomopsis cane and leaf spot. Overall, fungicide use was greater in 2003 than in 2002. Several factors, including economics and weather, contributed to the increased use of certain fungicides during the 2002 and 2003 seasons. To reduce costs, growers increased their use of lower-cost alternatives (e.g. fenarimol) and newer materials (e.g. tebuconazole and trifloxystrobin). The cool spring weather in 2003 resulted in an increase in Phomopsis; so, growers used more copper products to control it. The cool spring weather also caused excessive berry set in certain varieties that led to tight bunches prone to Botrytis bunch rot. In-season precipitation also occurred, which promotes bunch rot. Use of copper-based fungicides to control the bunch rot increased. Use of certain fungicides to manage powdery mildew decreased because of a better understanding of fungicide efficacy, resistance management, and powdery mildew phenology models that optimize application timing and use. The decreased use of azoxystrobin is related to the increased use of both trifloxystrobin and kresoxim-methyl for powdery mildew control. In addition, efforts by growers to reduce costs, pressure from wineries and packers to eliminate use of some products, lower pest pressure over seasons, and competition from other products further explain fluctuations in use from year to year.

Overall, use of insecticides and miticides decreased slightly. Cryolite use decreased in part due to competition from other pesticide alternatives for control of lepidopteran pests and because of restrictions from wineries and packers. Cryolite is used to control omnivorous leafroller and other Lepidopteran pests. The decrease in use of imidacloprid can be attributed to the large amount of imidacloprid that was soil-applied in southern San Joaquin Valley vineyards in 2002 to combat glassy-winged sharpshooter. Imidacloprid is used primarily for control of leafhoppers, mealybugs, and sharpshooters. Its use as a soil application can be expected to increase as more vineyards become infested with vine mealybug. Propargite use to control spider mites decreased mainly because of competition from newer miticides, its long re-entry interval, restrictions from wineries and packers, and cost. Methomyl use increased mainly due to increased incidence of vine mealybug in the San Joaquin Valley and around the state.

Herbicide use also decreased slightly. The decreased use of soil-applied herbicides (e.g., simazine and diuron) may be explained, in part, by growers' efforts to minimize the potential for off-site movement to ground and surface water and by regulatory restrictions. The decrease in herbicide use is also related to the incompatibility of these herbicides with the use of drip irrigation systems in vineyards, which is increasing. The increased use of paraquat, a foliar-applied herbicide, is due in part to growers' efforts to use foliar-applied herbicides instead of glyphosate in situations where extensive glyphosate use has altered the weed spectrum by selecting weed species with lower susceptibility to glyphosate.

The weed pests marestail and hairy fleabane are becoming a significant problem in vineyards in the San Joaquin Valley. Simazine and oxyfluorfen have been extensively used to manage these weeds; however, neither AI provides total control. This has altered the weed spectrum in vineyards, favoring species with lower susceptibility to these herbicides. Currently, oxyfluorfen is almost always added to glyphosate to help control these two weeds. Additional sprays of glyphosate and paraquat are often used to control these weeds. Glufosinate-ammonium has been very effective.

An additional reason for the overall decrease in herbicide use is the implementation of new production systems in raisin and fresh market grapes. Once established, vineyards planted to a gable or overhead system reduce the available light for weeds during the growing season. Growers then only need to spot treat to manage weeds in the vine row.

Almonds

Almonds are California's largest tree nut crop in total dollar value and acreage. They are the largest horticultural export from the United States. Approximately 6,000 almond growers produce nearly 100 percent of the commercial domestic supply and more than 75 percent of worldwide production. Nearly 80 countries import California almonds. The United States is by far the largest market for almonds; overseas, Germany is the largest market for almonds, consuming about 16 percent of the export crop, followed by Spain at about 15 percent. Other major importers include the Netherlands, Japan, France, the United Kingdom, Canada, India, China and Spain. The Pacific Rim nations are a rapidly growing market for California almonds.

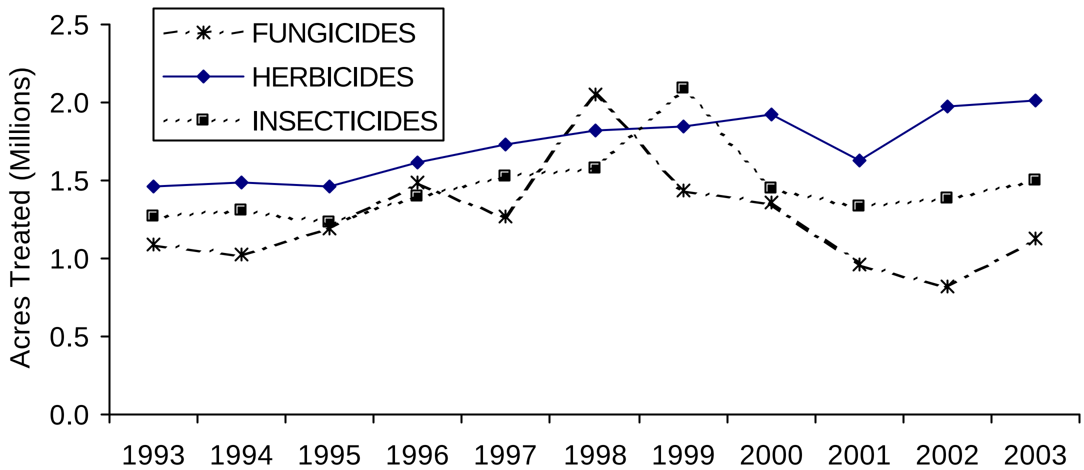
Table 14A. Total reported pounds of all AIs, acres treated, acres planted, and prices for almonds each year from 1998 to 2003. Bearing acres in 1998 to 2000 are from CDFA, 2002; bearing acres in 2001 and 2003 are from Noncitrus Fruits and Nuts 2003 Summary, U.S. Department of Agriculture (USDA), July 2004; all marketing year average prices are from NASS, July 2004.

	1999	2000	2001	2002	2003
Lbs AI	14,853,588	11,637,568	10,161,186	11,932,343	13,369,000
Acres Treated	7,436,397	7,214,954	5,049,552	5,423,253	6,353,572
Acres Bearing	480,000	500,000	530,000	545,000	550,000
Price $/lb	$0.86	$0.97	$0.91	$1.11	$1.57

Table 14B. Percent difference from previous year for reported pounds of all AIs, acres treated, acres planted, and prices for almonds from 1999 to 2003.

	1999	2000	2001	2002	2003
Lbs AI	-8	-22	-13	17	12
Acres Treated	11	-3	-30	7	17
Acres Bearing	4	4	6	3	1
Price $/lb	-39	13	-6	22	41

Figure 12. Acres of almonds treated by all active ingredients in the major types of pesticides from 1993 to 2003.



After a decline in almond pesticide use from 1998 to 2001, use increased from 2001 to 2003. From 2002 to 2003 use in pounds increased by 12% and acres treated increased by 17%. Insecticide and herbicide use increased only slightly (by 8% and 2%, respectively) but fungicide use increased by 37%. The largest percent increases in acres treated, between 2002 and 2003, were copper sulfate (pentahydrate), oryzalin, pyriproxyfen, hexythiazox, and 1,3–D. The largest percent decreases in use were for diazinon, phosmet, strychnine, trifluralin, and pendimethalin.

The major insecticides used (by acres treated) in 2003 were avermectin, petroleum oil, esfenvalerate, propargite, and chlorpyrifos; the major fungicides were iprodione, cyprodinil, azoxystrobin, copper hydroxide, and ziram; the major herbicides used were glyphosate, oxyfluorfen, paraquat dichloride, simazine, and 2,4–D, and the major fumigants used were aluminum phosphide, methyl bromide, and 1,3–dichloropropene (1,3–D).

In 2003, weather, particularly in the northern region, affected production. The wet winter and spring helped to increase navel orangeworm (NOW) mortality, thereby decreasing overwintering populations in mummy nuts. This reduced the need for early NOW sprays. However, the wet weather, which continued into May, did increase disease pressure that required additional fungicide applications. Weather in the central and southern regions was not quite as wet as in the north. Generally, growers checked for mummies and, if numbers were high, they used a winter sanitation program to help reduce the over-wintering population. In some regions, the combination of just enough mummy nuts missed and the mild winter significantly increased the reject potential.

Other factors play a role in understanding pesticide use trends. Almond-bearing acreage continued to increase in 2003, making increased applications more likely. Production was also up, along with the price for almonds. The fact that many growers had reduced pesticide applications for several years and were anticipating a more valuable crop may explain, in part, why some growers chose to put on applications to be sure to protect the more valuable 2003 crop. Generally, in a good year growers are more inclined to treat with pesticides to protect the crop, thereby increasing the number of applications.

Insect pressure in 2003 presented some unexpected results. Early in 2003 many growers thought pests were adequately controlled. However, some problems appeared later that required increased applications. Peach twig borer (PTB) was somewhat of a problem as well as Oriental fruit moth (OFM). These two pests caused significant nut damage in some orchards. The life cycle of OFM and the condition of the nuts were such that damage occurred. Untimely rains delayed the harvest significantly and resulted in much more NOW, PTB and OFM damage than was expected. The increased NOW pressure accounted for the increase in applications of tebufenozide in May and azinphos methyl and chlorpyrifos at hull split.

Ant damage was a problem in 2002 in a number of orchards. To prevent such a problem from occurring again, growers made applications for control in 2003, which explains the increased use of pyriproxyfen and partially explains the increased use of chlorpyrifos.

In 2003, many growers moved away from preemergence herbicides for weed control and instead used glyphosate as a strip spray. Oxyfluorfen was used at a low rate mainly to take advantage of its contact action as a boost for glyphosate. It would be unusual to use oxyfluorfen alone as a preemergence material.

The use of the fumigants methyl bromide and 1,3–D were higher in 2003 compared to 2002. Most of this increase can be attributed to treatment on newly planted and replanted almond acres in Kern County.

Alfalfa

Alfalfa hay is produced for animal feed. Most counties produce some alfalfa hay, but half of the state's production comes from Kern, Imperial, Tulare, Merced, and Fresno counties. Harvested alfalfa acres decreased in 2003 by 4 percent compared to 2002. Total pounds of pesticide AI applied also declined by 6 percent to the second lowest level in the past six years. The dairy industry is the biggest market for alfalfa hay production.

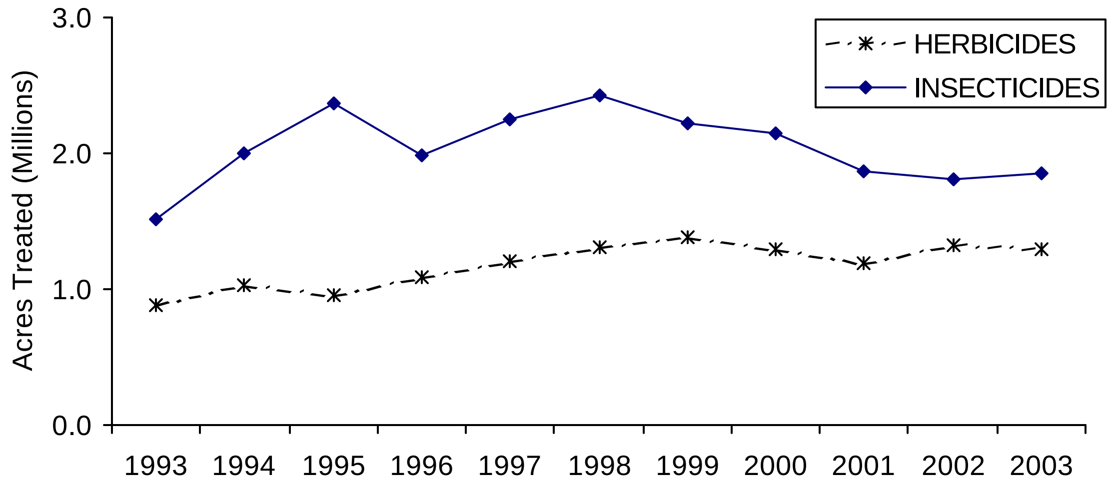
Table 15A. Total reported pounds of all AIs, acres treated, acres planted, and prices for alfalfa each year from 1998 to 2003. Harvested acres in 1998 to 2001 are from CDFA, 2002; harvested acres in 2002 and 2003 are from California Field Crop Review, CASS, January 2004; all marketing year average prices are from NASS, July 2004.

	1999	2000	2001	2002	2003
Lbs AI	3,746,269	3,315,152	2,919,521	3,008,510	2,921,442
Acres Treated	5,361,392	5,187,743	4,446,461	4,468,943	4,863,413
Acres Harvested	1,050,000	1,020,000	1,010,000	1,140,000	1,090,000
Price $/ton	$86.50	$92.00	$120.00	$98.00	$93.00

Table 15B. Percent difference from previous year for reported pounds of all AIs, acres treated, acres planted, and prices for alfalfa from 1999 to 2003.

	1999	2000	2001	2002	2003
Lbs AI	-2	-12	-12	3	-3
Acres Treated	-3	-3	-14	1	9
Acres Harvested	0	-3	-1	13	-4
Price $/ton	-12	6	30	-18	-5

Figure 13. Acres of alfalfa treated by all AIs in the major types of pesticides from 1993 to 2003.



Pesticide use in alfalfa increased from 1993 to 1998 and then declined from 1998 to 2003. Insecticide and herbicide use generally followed the same pattern as overall pesticide use. Major pesticides with the largest percent increases were (S)-cypermethrin, chlorophacinone, mineral oil, indoxacarb, and propargite; major pesticides with the largest percent decreases were *Bacillus thuringiensis*, naled, EPTC, imazethapyr, and formetanate hydrochloride.

Insecticides with the largest acres treated in 2003 were chlorpyrifos, lambda-cyhalothrin, indoxacarb, cyfluthrin, and methomyl. Herbicides used on large acreages in 2003 were trifluralin, paraquat dichloride, diuron, hexazinone, and clethodim.

Insecticide use in pounds was reduced by 23 percent overall, though the use of chlorpyrifos increased by 32 percent in 2003. Chlorpyrifos is used primarily to manage Egyptian alfalfa weevil but may have also been used to control late season armyworms, which were a major problem in the San Joaquin Valley in 2003. Pyrethroids, such as lambda-cyhalothrin, which also controls Egyptian alfalfa weevil, replaced much of the chlorpyrifos during the winter and early spring of 2002. This trend reversed in 2003. As chlorpyrifos use increased, the use of the low risk alternative, lambda-cyhalothrin, decreased from 42,147 pounds in 2002 to only 7,173 pounds in 2003. Methomyl use increased along with a further increase in use of indoxacarb for late season armyworms. Indoxacarb, a new insecticide for lepidopteron pests and leafhoppers, became the tenth most popular AI in 2002 and the fifth most popular in 2003, increasing from 8,243 pounds AI in 2002 to 18,547 in 2003. Malathion use decreased 39 percent, dimethoate use decreased 46 percent and carbofuran use decreased 11 percent, accounting for 107,860 pounds of the 179,796 overall reductions in insecticide use in 2003.

Overall, herbicide use decreased 3 percent from 1,363,085 pounds in 2002 to 1,320,834 pounds in 2003. Trifluralin, the leading herbicide used in each of the last four years, decreased by 4 percent compared to 2002. Diuron use increased 14 percent, most likely to reduce costs and broaden winter weed control when combined with hexazinone, which increased 20 percent.

Tomato (Processing)

Virtually all of the 289,000 acres of processing tomatoes planted in 2003 were located in the Sacramento Valley and San Joaquin Valley. Fresno County had the largest acreage (104,300 acres), followed by Yolo County (39,200 acres) and San Joaquin County (34,400 acres). The decrease in planted acreage from 2002 to 2003 (nearly 7,000 acres) was followed by an increase in un-harvested acreage from 2002 (5,000 acres) to 2003 (15,000 acres).

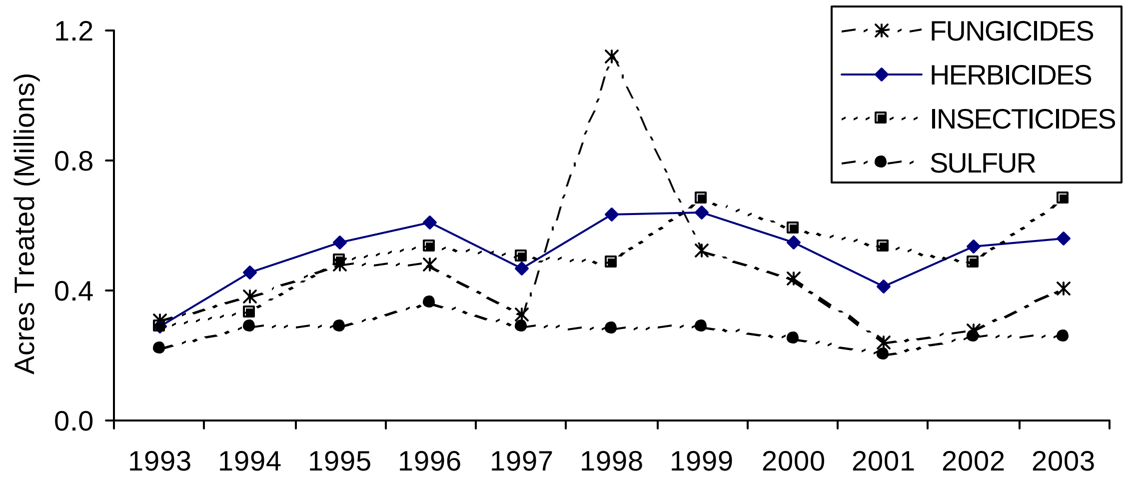
Table 16A. Total reported pounds of all AIs, acres treated, acres planted, and prices for processing tomatoes each year from 1998 to 2003. Harvested acres in 1998 to 2001 are from CDFA, 2002; harvested acres and marketing year average prices in 2001 to 2003 are from Vegetables 2003 Summary, USDA, January 2004; prices from 1998 to 2000 are from Chuck Rivera, California Tomato Research Institute, Inc, taken from a recent section 18 application for Dual® use in tomato.

	1999	2000	2001	2002	2003
Lbs AI	12,754,448	10,665,766	7,917,190	10,645,802	10,943,416
Acres Treated	2,762,511	2,404,273	1,897,319	2,032,755	2,658,987
Acres Harvested	329,000	271,000	254,000	291,000	274,000
Price $/ton	$58.00	$51.50	$57.50	$56.80	$57.20

Table 16B. Percent difference from previous year for reported pounds of all AIs, acres treated, acres planted, and prices for processing tomatoes from 1999 to 2003.

	1999	2000	2001	2002	2003
Lbs AI	10	-16	-26	34	3
Acres Treated	-12	-13	-21	7	31
Acres Harvested	18	-18	-6	15	-6
Price $/ton	6	-11	12	-1	1

Figure 14. Acres of processing tomatoes treated by all AIs in the major types of pesticides from 1993 to 2003.



Pesticide use on processing tomatoes generally decreased from 1998 to 2001, then increased in 2002 and 2003. Acres treated with insecticides and fungicides increased by 40% and 46% respectively from 2002 to 2003; herbicide use increased only by 5%. The major pesticides with the largest percent increase in 2003 were pyraclostrobin, copper oxide, maneb, acetamiprid, and copper hydroxide; the largest percent decreases in 2003 were pebulate, carbaryl, thiamethoxam, malathion, and napropamide.

By acres treated, the major insecticides in processing tomatoes in 2003 were tebufenozide, indoxacarb, Bt, esfenvalerate, methomyl; the major herbicides were trifluralin, rimsulfuron, glyphosate, (S)-metolachlor, and metribuzin; and the major fungicides were sulfur (though used as a miticide as well), chlorothalonil, copper hydroxide, pyraclostrobin, and mefenoxam.

Northern California growers, particularly those in Colusa, Sutter and Yolo counties were impacted by an unusual series of thunderstorms in August that produced up to 2 inches of rain. This was followed by above normal temperatures, high humidity and stagnant air movement. Fields were not harvested due to high mold incidence, reflected in the large increase in un-harvested acreage.

The use of insecticides considered low risk increased 44 percent and the percentage of low risk insecticides applied increased from 36 percent in 2002 to 42 percent in 2003. Methomyl use increased from 16,000 pounds in 2002 to 45,000 pounds in 2003 due to curly top concerns in the south; the use of methomyl in Fresno County increased from 6,851 pounds in 2002 to 31,433 pounds in 2003.

Herbicide use in 2003 was similar to 2002, perhaps reflecting continued grower concern about the costs and availability of hand labor. The use of several preplant herbicides increased in 2003; trifluralin, metolochlor, and metribuzin use increased, 6 percent, 36 percent, and 20 percent, respectively. The lack of significant rainfall during January and February may have contributed to increased use of preplant herbicides during seedbed preparation and early stand establishment. Also, transplant tomatoes are increasing, resulting in increased use of metolochlor and decreased use of pebulate and napropamide.

Sulfur and metam-sodium made up over 87 percent of the total pounds of AIs applied to tomatoes in 2003, similar to the trend in 2001 and 2002. Sulfur is used for russet mite and powdery mildew, annual pests throughout California. Metam-sodium is used as a preplant herbicide.

Early season weather in April and May favored bacterial speck and other early season diseases; therefore, the use of copper hydroxide increased over 3-fold, from 26,141 pounds in 2002 to 94,582 pounds in 2003. Increased use of mancozeb and maneb (21,620 pounds in 2002 and 86,807 pounds in 2003) is attributed to copper resistant bacterial speck during the early season in the south and some concern over late blight. Use of chlorothalonil increased 8 percent overall, applied in August for late-season disease control, partly in response to the unusual rains. Yolo County growers used 46 percent more chlorothalonil than in 2002.

Rice

California's Sacramento Valley contains more than 95 percent of the state's rice acreage. The remainder is in north to central San Joaquin Valley. The leading rice-producing counties are Colusa, Sutter, Butte, Glenn, and Yolo. Approximately 600,000 acres in the Sacramento Valley are of a soil type restricting the crops to rice or pasture. The remainder of the acreage has greater crop flexibility.

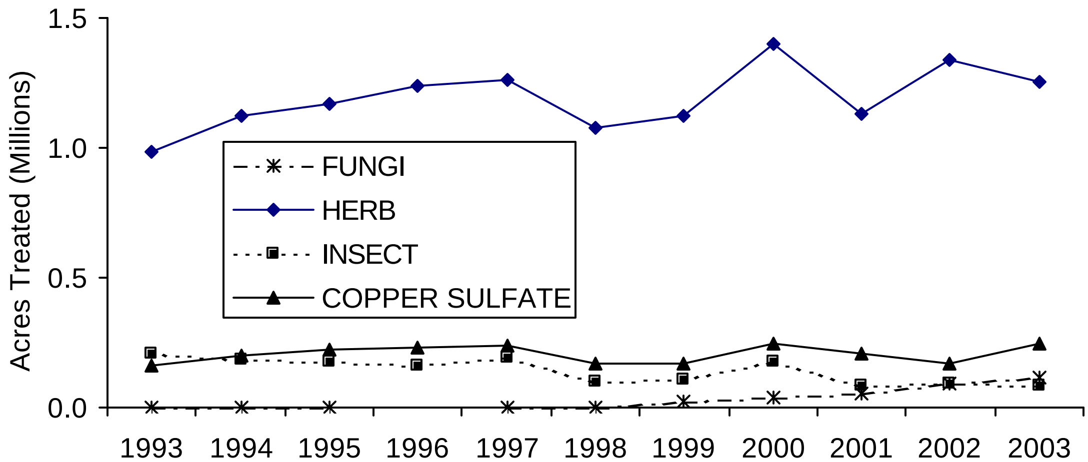
Table 17A. Total reported pounds of all AIs, acres treated, acres planted, and prices for rice each year from 1998 to 2003. Planted acres in 1998 to 2001 are from CDFA, 2002; planted acres in 2002 and 2003 are from Field Crop Review, CASS, January 2004; marketing year average prices in 1998 and 1999 are from NASS, July 2000; prices in 2000 and 2001 are from NASS, July 2002; prices for 2002 and 2003 are from NASS, July 2004.

	1999	2000	2001	2002	2003
Lbs AI	4,947,221	7,084,205	5,945,926	5,962,401	6,490,215
Acres Treated	1,639,151	2,164,710	1,738,355	2,062,070	2,229,184
Acres Planted	510,000	550,000	473,000	533,000	509,000
Price $/cwt	$6.40	$4.99	$5.28	$6.32	$9.65

Table 17B. Percent difference from previous year for reported pounds of all AIs, acres treated, acres planted, and prices for rice from 1999 to 2003.

	1999	2000	2001	2002	2003
Lbs AI	-1	43	-16	0	9
Acres Treated	11	32	-20	19	8
Acres Planted	11	8	-14	13	-5
Price $/cwt	-30	-22	6	20	53

Figure 15. Acres of rice treated by all AIs in the major types of pesticides from 1993 to 2003.



Total pestic ide use in rice has generally increased since 1993, although most of that increase was due to adjuvants. Pesticide use was similar in 2002 and 2003, increasing by just 8%. Herbicides accounted for most of the pesticide use; between 73 to 80% of non-adjuvant pesticide acres treated has been with herbicides. Although herbicide use has increased slightly in the 1990's it decreased by 6% from 2002 to 2003. Insecticide use has been generally decreasing and fungicide use increasing. Pesticides with large increases in use include (s)-cypermethrin, clomazone, oxyfluorfen, paraquat dichloride, and carfentrazone-ethyl. Pesticides with large decreases in use include bensulfuron-methyl, diflubenzuron, MCPA, molinate, lambda-cyhalothrin, and thiobencarb.

The major insecticides by acres treated in rice in 2003 were lambda-cyhalothrin, (S)-cypermethrin, and diflubenzuron; the major herbicides were propanil, triclopyr, thiobencarb, molinate, and cyhalofop-butyl; and the major fungicide was azoxystrobin. The second most commonly used pesticide was copper sulfate, which is used to control algae and tadpole shrimp.

In 2003, there were no major shifts in pest pressure. Rice acres planted decreased slightly from 533,000 acres in 2002 to 509,000 acres in 2003. Besides acreage, other reasons for decreases in herbicide use include weed resistance, wet weather causing difficulty with proper application timing, and increased grower confidence with the use of new herbicides on the market. Reasons for increases in herbicide use include the shift to new herbicides in areas of resistance, and the need for tank mixes and sequential applications for managing herbicide resistant weeds. Prices are not a factor in explaining changes in pesticide use because there are few rice pesticides and the modes of action limited so applications are based on need and not crop price.

The use of the herbicides propanil and triclopyr remained nearly stable; the moderate decreases likely due to the decrease in rice acreage. Wet weather in 2003 made it difficult to properly time the use of both propanil and thiobencarb. For example, thiobencarb is an early-season herbicide applied when the rice is young and the weeds are immature. Storms delayed herbicide applications and the weeds became too advanced for thiobencarb to be effective. The moderate decrease in use of bispyribac-sodium, a reduced-risk herbicide registered for use on California rice in 2002, can be attributed to the acreage reduction. Molinate use continues to decline due to weed resistance and also because it is not compatible with some of the postemergence foliar materials that require drainage. The decreased use of bensulfuron-methyl is due to widespread and worsening resistance. In those areas where bensulfuron-methyl is no longer effective, carfentrazone-ethyl is being used to control weeds. The carfentrazone-ethyl /clomazone combination has become very popular as an early into-the-water field application for weed control. Clomazone was first registered for use on California rice in 2003 and is being used on much of the acreage where molinate (watergrass control) and thiobencarb (sprangletop control) use has been dropped. Cyhalofop-butyl, a reduced-risk herbicide first registered for use on California rice in 2003, is a popular alternative to thiobencarb as a flexible tool for sprangletop control.

Lambda-cyhalothrin is an insecticide used primarily for rice water weevil control and secondarily for armyworm control. Its use declined mainly due to competition from (s)–cypermethrin that was registered for the first time in California rice in 2003. Insect pressure is low for California rice and lambda-cyhalothrin is used on approximately 10 percent of all rice planted in California.

Copper sulfate is the only algaecide registered for use on California rice, and one of the few products acceptable for organic rice production. The product doubles as an insecticide, which is very important to organic rice growers.

Azoxystrobin is reduced-risk and the only foliar fungicide registered for use on California rice. Disease pressure is low for California rice, which is the reason azoxystrobin is used on approximately one-fifth the total acres planted.

Oranges

Oranges are the eighth highest value crop grown in California. Eighty-six percent of California oranges are grown in the San Joaquin Valley. The rest are grown in the interior region (five percent in Riverside and San Bernardino counties) and on the south coast (about seven percent of the state's acreage, mostly in Ventura and San Diego counties).

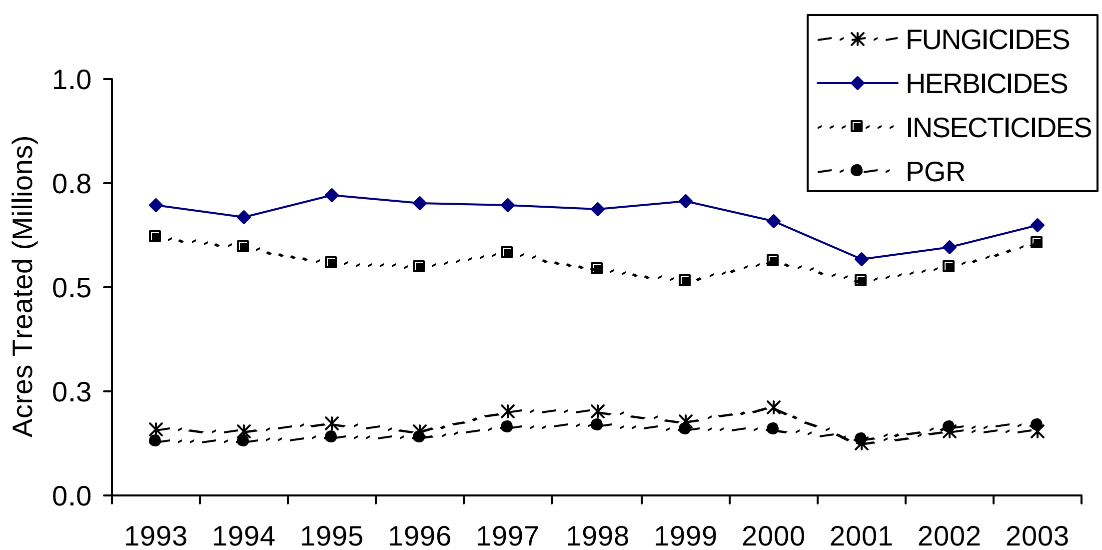
Table 18A. Total reported pounds of all AIs, acres treated, acres planted, and prices for oranges each year from 1997-98 to 2003. Bearing acres in 1997-98 to 2000-01 are from CDFA, 2002; bearing acres in 2001-02 and 2002-03 are from Citrus Fruits 2004 Summary, USDA, Sept 2004; marketing year average prices (equivalent P.H.D.) in 1997-98 are from NASS, July 2001; prices in 1998-99 and 1999-00 are from NASS, July 2002; prices in 2000-01 to 2002-03 are from NASS, July 2004. A box is about 75 pounds of oranges.

	1998-99	1999-00	2000-01	2001-02	2002-03
Lbs AI	8,779,130	8,569,479	6,293,041	6,949,452	7,237,990
Acres Treated	2,039,194	2,181,618	1,727,085	1,911,195	2,067,987
Acres Bearing	201,500	195,500	194,500	195,000	189,500
Price $/box	$11.22	$5.40	$9.44	$10.85	$7.78

Table 18B. Percent difference from previous year for reported pounds of all AIs, acres treated, acres planted, and prices for oranges from 1999 to 2003.

	1998-99	1999-00	2000-01	2001-02	2002-03
Lbs AI	-14	-2	-27	10	4
Acres Treated	1	7	-21	11	8
Acres Bearing	1	-3	-1	0	-3
Price $/box	26	-52	75	15	-28

Figure 16. Acres treated in oranges by all AIs in the major types of pesticides from 1993 to 2003.



Total pesticide use and insecticide, herbicide, and fungicide use on oranges has remained similar from year to year in the 1990's, though there was a small increase of each pesticide type from 2001 to 2003.

Overall insecticide use was up slightly from 2002. Insecticides used most (in terms of pounds of AI) in 2003 were petroleum oil, mineral oil, chlorpyrifos, cryolite, and carbaryl. When expressed in terms of acres treated, this list changes to petroleum oil, spinosad, cyfluthrin, chlorpyrifos and acetamiprid. The discrepancy lies in the wide variation in rates applied for the various pesticides (some pesticides are applied at high rates per acre (kaolin, cryolite) and some at very low rates per acre (spinosad, cyfluthrin). Between 2002 and 2003 large increases were also reported in the use of the reduced-risk insecticides acetamiprid, fenbutatin-oxide, buprofezin and Bt, even though costs to manage insects are increasing since the newer reduced-risk insecticides are more expensive.

Overall, fungicide use by acres treated was similar in 2002 and 2003. The highest-use fungicides (by acres treated) were copper hydroxide, copper sulfate, mefenoxam, copper oxide, and harpin protein. The reduced-risk fungicides mefenoxam and harpin protein were used on a much larger percentage of acres in 2003 than in 2002.

Herbicide use by acres treated increased slightly between 2002 and 2003.The herbicides used most (by acres treated) were glyphosate, diuron, simazine, bromacil, and paraquat dichloride.

Major pesticides with the largest percent increase in acres treated from 2002 to 2003 were acetamiprid, harpin protein, fenbutatin-oxide, hydrolyzed corn product, mefenoxam, and buprofezin. Major pesticides with the largest percent decrease were methomyl, sabadilla alkaloids, chlorpyrifos, diphacinone, and chlorophacinone

According to the National Oceanic and Atmospheric Agency, the citrus growing regions of California had another dry year (the fourth in a row) with the interior region receiving only 25 percent of normal rainfall. It was a mild winter and summertime temperatures were above normal across California.

A number of new insect pests arrived or spread to new areas of California during 2003. The citrus leafminer expanded its range from Imperial County into San Diego and Riverside counties. It does not affect fruit quality so it only needs to be controlled in new plantings and in nurseries. Area-wide control strategies were implemented for glassy-winged sharpshooter (GWSS) in Tulare and Ventura counties. The Texas citrus mite was first discovered in Kern County in the fall of 2003 and treatments were required to prevent fruit damage. An infestation of Mexican fruit fly was detected and eradicated in the San Diego area.

Growers are required to spray for GWSS in most of the citrus-growing regions. The GWSS program continues to disrupt the reduced-risk approach that is in place in the interior region. Growers prefer using a systemic pesticide that does not impact beneficial insects, e.g. imidacloprid. However, this insecticide acts slowly and so when rapid knockdown of sharpshooters is needed, acetamiprid is foliar applied.

Petroleum oil and mineral oil are broad-spectrum insecticides for aphids, mites and scales; chlorpyrifos is a broad-spectrum insecticide for insects; cyfluthrin is used for citrus thrips, katydids and worms; spinosad is used for citrus thrips, orangeworms and katydids; and acetamiprid is used for GWSS. Cryolite is used for katydids, leafrollers and cutworms. Kaolin is a whitewash that is used to make citrus trees less attractive to GWSS; some growers also use it to reduce heat stress. *Bacillus thuringiensis* is used for caterpillar pests. Buprofezin, pyriproxyfen and carbaryl are used to manage scale insects. Fenbutatin-oxide is a reduced-risk insecticide used to manage mites.

Use of the insecticide carbaryl decreased from 2002 to 2003 because it is less efficacious than other insecticides in managing scale pests. Growers are rotating buprofezin and pyriproxyfen to control red scale. Citrus thrips are developing resistance to pyrethroids, so growers are using spinosad. Growers are tank-mixing cyfluthrin, fenpropathrin, or chlorpyrifos with the spinosad used for citrus thrips in order to control katydids, which appear at the same time as thrips. Growers used more of the less expensive petroleum and mineral oils since citrus prices were low in 2003 and as an adjuvant with some of the newer insecticides. Use of kaolin and acetamiprid increased as a result of the GWSS spray program.

The fungicides copper hydroxide, copper sulfate, sulfur and copper oxide are used to prevent Phytophthora gummosis, Phytophthora root rot, and fruit diseases such as brown rot and Septoria spot. Sulfur can also be used to control mites and citrus thrips. Use of these fungicides decreased between 2002 and 2003. Imazalil is used as a postharvest application to non-stored commodities. Harpin protein is a fairly new product and growers tried it for citrus scab, brown spot, greasy spot and bacterial leaf spot.

The herbicide glyphosate is used to control weeds post-emergence. Diuron, simazine, bromacil and norflurazon are used for preemergence weed control. Growers use herbicides to prepare the ground prior to planting. Glyphosate, simazine and diuron increases are most likely due to replanting.

Over half of the increased use of pesticides (in pounds) on oranges from 2002 to 2003 was due to use of the preplant fumigants metam sodium and 1,3–D. These fumigants are used to protect newly planted orange trees from Phytophthora root rot. This increased use appears to be caused by large-scale removal of Valencia oranges and their replacement by new plantings of other citrus varieties. The market for Valencia oranges has been poor, although it has improved recently. Therefore, many growers bulldozed the blocks of Valencia trees and replaced them with other varieties of citrus.

Head (Iceberg) Lettuce

Head lettuce is grown in four regions in the state: the central coastal area (Monterey, San Benito, Santa Cruz, and Santa Clara counties); the southern coastal area (Ventura and Santa Barbara counties); the San Joaquin Valley (Fresno, Kings, and Kern counties); and the southern deserts (Imperial and Riverside counties). In 2002, 55 percent of all California head lettuce was planted in the central coastal area, 16 percent in the southern coastal area, 17 percent in the San Joaquin Valley, and 12 percent in the southern deserts. California produces 70 to 75 percent of the head lettuce grown in the United States annually.

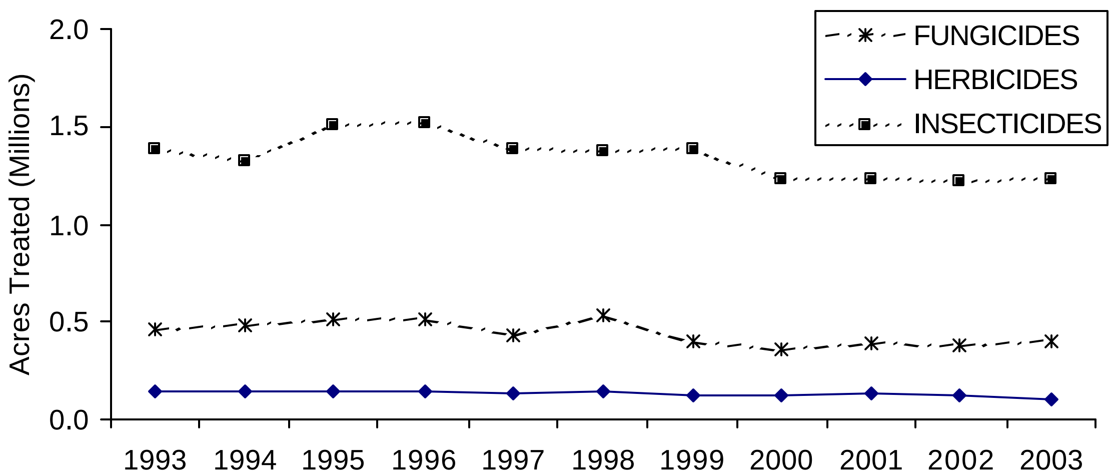
Table 19A. Total reported pounds of all AIs, acres treated, acres planted, and prices for head lettuce each year from 1998 to 2003. Harvested acres in 1998 to 2000 are from CDFA, 2002; harvested acres in 2001 to 2003 are from Vegetables 2003 Summary, USDA, January 2004; all marketing year average prices are from NASS, July 2004.

	1999	2000	2001	2002	2003
Lbs AI	1,631,179	1,770,426	1,431,087	1,440,302	1,468,612
Acres Treated	2,232,832	2,028,305	2,071,215	2,009,926	2,042,679
Acres Harvested	140,000	130,000	128,000	130,000	135,000
Price $/cwt	$13.70	$18.80	$18.50	$14.90	$21.00

Table 19B. Percent difference from previous year for reported pounds of all AIs, acres treated, acres harvested, and prices for head lettuce from 1999 to 2003.

	1999	2000	2001	2002	2003
Lbs AI	-16	9	-19	1	2
Acres Treated	-8	-9	2	-3	2
Acres Harvested	4	-7	-2	2	4
Price $/cwt	-16	37	-2	-19	41

Figure 17. Acres of head lettuce treated by all active ingredients in the major types of pesticides from 1993 to 2003.



Pesticide use on head lettuce has gradually declined since 1995, but most of the decline in acres treated was due to adjuvants and in pounds by fumigants; other pesticide use has remain fairly constant from year to year. Major pesticides with the largest percent increase in acres treated were (S)-cypermethrin, fosetyl-al, acetamiprid, tebufenozide, and indoxacarb. Major pesticides with the largest percent decrease were metam-sodium, mefenoxam, glyphosate, benefin, and copper hydroxide. During 2003, the top insecticides used (by acres treated) were permethrin, diazinon, spinosad, acephate, and imidacloprid. The main fungicides used were maneb, fosetyl-al, iprodione, acibenzolar-S-methyl, and vinclozolin. Three herbicides dominated? propyzamide (pronamide), bensulide, and benefin. Four fumigants? metam-sodium, chloropicrin, methyl bromide, and 1,3–dichloropropene? were used.

There was less use of herbicides and fumigants during 2003, and higher use of fungicides. The rising popularity of banding, which reduces application rates and costs, may be the reason for reduced herbicide use. The increase in fungicide use is possibly due to a wetter spring along the Central Coast, which led to outbreaks of diseases such as downy mildew. More acres were treated with insecticides during 2003 than 2002, but fewer pounds were used, possibly attributable to increased use of insecticides that are applied at low rates. There was a four percent increase from 2002 to 2003 in acres of head lettuce planted.

The insecticides permethrin and spinosad are used to manage larvae of beet armyworm and cabbage looper, primarily pests in the southern deserts. Use of permethrin dropped in 2003, possibly due to less worm pressure in the southern deserts, and the increased use of many reduced-risk insecticides such as spinosad, indoxacarb, and emamectin. Spinosad use increased from 2002 to 2003, probably due to high thrips populations. Thrips have become serious pests in coastal and desert regions of California. Use of indoxacarb, an effective reduced-risk material for worms, increased by a third. In the central coastal area, insecticides such as avermectin are replacing permethrin to manage leafminers. However, avermectin use in 2003 decreased because leafminers posed little problem in this area. Use of cyromazine, the most effective leafminer larvicide, increased by almost 50 percent due to a registration change that reduces plantback restrictions.

Diazinon is a preplant treatment applied to manage soil pests. Its use increased in the coastal areas due to higher-than-normal pressure from symphylans. Diazinon use increased in the southern deserts, where it is often used for stand-establishment pests such as crickets, darkling ground beetles, earwigs, and sowbugs. Use of lambda-cyhalothrin decreased throughout California, including the southern deserts, where use had increased in 2002. In the central coastal area, use of imidacloprid fell because lettuce aphids were scarce.

In 2003, maneb was the dominant fungicide used in head lettuce production, primarily to control downy mildew and prevent anthracnose. Use of fosetyl-al more than doubled, and was used on about 40 percent of acreage planted. Although fosetyl-al costs more than maneb, it can be used much closer to harvest. However, examples of downy mildew tolerance to fosetyl-al have been documented. Use of acibenzolar-S-methyl, first registered for lettuce in 2001, increased seven-fold between 2001 and 2002, but fell 15 percent from 2002 to 2003. This new reduced-risk fungicide stimulates plants to resist the pathogen that causes downy mildew. Although characterized as more effective against downy mildew than fosetyl-al, acibenzolar-S-methyl is more expensive. Use of iprodione in 2003 was less than in 2002, as well as that for vinclozolin, also used for lettuce drop management. Use of another lettuce drop fungicide, dicloran, increased only slightly. Another new biofungicide, QST 713 strain of dried *Bacillus subtilis,* was used on three times more acres in 2002 than in 2001, but use fell in 2003. First registered for use on lettuce in 2000, *B. subtilis* effectively manages bacterial leaf spot and was the most frequently used bactericide.

Herbicide use decreased by 14% from 2002 to 3004. The rising popularity of banding, which reduces application rates and costs, may be the reason for reduced herbicide use. Use of propyzamide (pronamide), applied as a postplant–preemergence herbicide, decreased from 2002 to 2003, but was consistent with its use for the past ten years, was applied to many more acres than the preemergence bensulide, which targets small-seeded annual grasses and is not as efficacious as propyzamide in the coastal areas. Use of benefin, a pre-plant herbicide, decreased from 2002 to 2003, especially in the San Joaquin Valley.

Nematodes are rarely economic pests of head lettuce, so soil is primarily fumigated to control soil-borne diseases. Although primarily used for this purpose, metam-sodium can also be used to control weeds, if somewhat unreliably. In 2003, one-third fewer acres were treated with this fumigant and preplant herbicide than in 2002, possibly because many growers have switched to band rather than broadcast applications. Still, metam-sodium was applied to more acreage than other fumigants, although fields fumigated with metam-sodium represent less than 1 percent of all lettuce acreage. The second most widely used fumigant, chloropicrin, reduces soil populations of Verticillium wilt and lettuce drop (Sclerotinia drop) alone or when combined with methyl bromide or 1,3–dichloropropene. From 2002 to 2003, use of chloropicrin more than doubled, but use of 1,3–D fell about one third. Most applications of both fumigants were made in Monterey County. In 2003, numbers of acres treated with methyl bromide doubled compared to those treated in 2002, although this represented only about 0.4 percent of acres planted.

Peaches and Nectarines

California ranks first in the U. S. in the production of peaches and nectarines, producing 71 percent of the peaches in the U. S. and 96 percent of the nectarines. California produces 100 percent of the U.S. processed peaches and 49 percent of the U.S. fresh market peaches. Clingstone peaches comprise about 70 percent of the total peach crop in California and are used exclusively for processing, which includes canning (including baby food), juice and frozen. The California fresh shipping freestone peach production represents 30 percent of the annual tonnage. Fresh market nectarines comprise approximately 98 percent of the annual tonnage of nectarines. Clingstone peach acreage increased slightly in 2003 over 2002, while freestone peach acreage decreased slighty and nectarine acreage remained unchanged. Pest management issues for peaches and nectarines are very similar so these crops are discussed together.

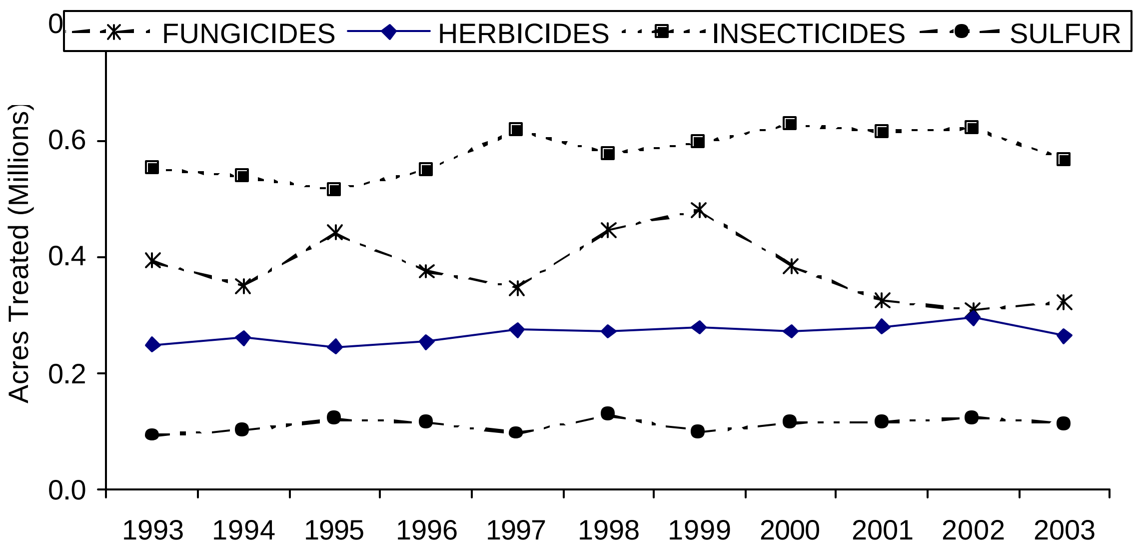
Table 20A. Total reported pounds of all AIs, acres treated, acres planted, and prices for peaches and nectarines each year from 1998 to 2003. Bearing acres for peaches and nectarines in 1998 to 2000 are from CDFA, 2002; bearing acres in 2001 to 2003 are from Noncitrus Fruits and Nuts 2003 Summary, USDA, July 2004; marketing year average prices for fresh peach in 1998 and 1999 are from NASS, July 2000; fresh peach prices for 2000 and 2001 are from NASS, July 2002; prices for fresh peaches in 2002 and 2003 and for nectarines all years are from NASS, July 2004.

	1999	2000	2001	2002	2003
Lbs AI	5,956,635	6,762,775	6,003,210	6,510,986	6,486,354
Acres Treated	1,700,676	1,687,765	1,609,557	1,582,771	1,513,180
Acres Bearing Peach	67,800	67,200	65,800	68,000	68,000
Acres Bearing Nectarine	35,500	35,500	36,500	36,500	36,500
Price $/tons Peach	$396.00	$380.00	$428.00	$418.00	$406.00
Price $/tons Nectarine	$411.00	$398.00	$464.00	$382.00	$436.00

Table 20B. Percent difference from previous year for reported pounds of all AIs, acres treated, acres planted, and prices for peaches and nectarines from 1999 to 2003.

	1999	2000	2001	2002	2003
Lbs AI	-12	14	-11	8	0
Acres Treated	0	-1	-5	-2	-4
Acres Bearing Peach	1	-1	-2	3	0
Acres Bearing Nectarine	0	0	3	0	0
Price $/tons Peach	0	-4	13	-2	-3
Price $/tons Nectarine	-13	-3	17	-18	14

Figure 18. Acres of peaches and nectarines treated by all AIs in the major types of pesticides from 1993 to 2003.



Pesticide use on peaches and nectarines have fluctuated from year to year since 1993 but with no overall increasing or decreasing trends. The total pounds of pesticides applied and the total acres treated were slightly less in 2003 than in 2002. Major pesticides with the greatest percentage increase in acres treated on peaches and nectarines from 2002 to 2003 were pyriproxyfen, oryzalin, hexythiazox, azoxystrobin, and captan. Major pesticides with the greatest percentage decreases were napropamide, carbaryl, petroleum distillates, pyridaben, and clofentezine. The major insecticides used (by acres treated) in peaches and nectarines in 2003 were esfenvalerate, petroleum oil unclassified, phosmet, mineral oil, and the pheromones E–8–dodecenyl acetate, Z–8–dodecenyl acetate, and Z–8–dodecenol; the major fungicides used were sulfur, copper hydroxide, propiconazole, iprodione, and ziram; and the major herbicides used were glyphosate, oxyfluorfen, paraquat dichloride, simazine, and 2,4-D.

In 2003, weather was a production factor, particularly in the northern region. The wet weather, which continued into May, increased disease pressure that required some additional fungicide applications. In particular copper, azoxystrobin, and captan use increased. The use of most other fungicides went down compared to 2002. Hot summer weather in 2003 was also a factor. The heat caused mites to come out early in cling peaches, which extended the season and resulted in increased applications. This accounts for the increased use of mineral oil and hexythiazox to control mites. The use of other miticides decreased.

Other factors play a role in understanding trends in pesticide use. Peach- and nectarine-bearing acreage was the same in 2002 and 2003. The "Green Drop" program affected peach production in 2003. Through this program, cling peach growers were paid to remove peaches in an effort to balance supply with demand. The reduced production resulted in less acres treated. The price for peaches, particularly freestone, was down in 2003. The price for nectarines was up; however, production was down. Generally, when prices and production are down, growers will look at ways to reduce production costs, such as reducing pesticide applications.

Since OFM was less of a problem in 2003 than it was in 2002, the use of pyrethroid pesticides (e.g., esfenvalerate and permethrin) decreased, as did the use of phosmet, carbaryl, and methomyl on freestone varieties. Many freestone peach growers used pheromone mating-disruption for OFM early in the season. Some growers reportedly were not pleased with the results; therefore, they did not do a mid-season second hanging of pheromone dispensers (due to the labor cost to hang). Reportedly, many clingstone growers used sprayable pheromones in their pyrethroid PTB spray to increase efficacy; however, this practice did not appear to account for any increase in pesticide use.

Controlling San Jose scale continues to be a primary concern for freestone peach growers in the San Joaquin Valley. If infestations are light, then oil alone is used. Heavier infestations require a dormant organophosphate or pyrethroid spray plus oil. Katydids continue to be a secondary pest of concern. As growers continue to move away from using broad-spectrum pesticides, the incidence of fruit damage by katydids is more prevalent. Although pesticides such as phosmet, spinosad and methomyl are reportedly used to control katydid, the use of all these pesticides did not increase in 2003.

Strawberries

Strawberries are grown mostly for fresh market. Depending on market prices, some are processed. California strawberry production occurs primarily along the central and southern coast, with small but significant production occurring in the central valley.

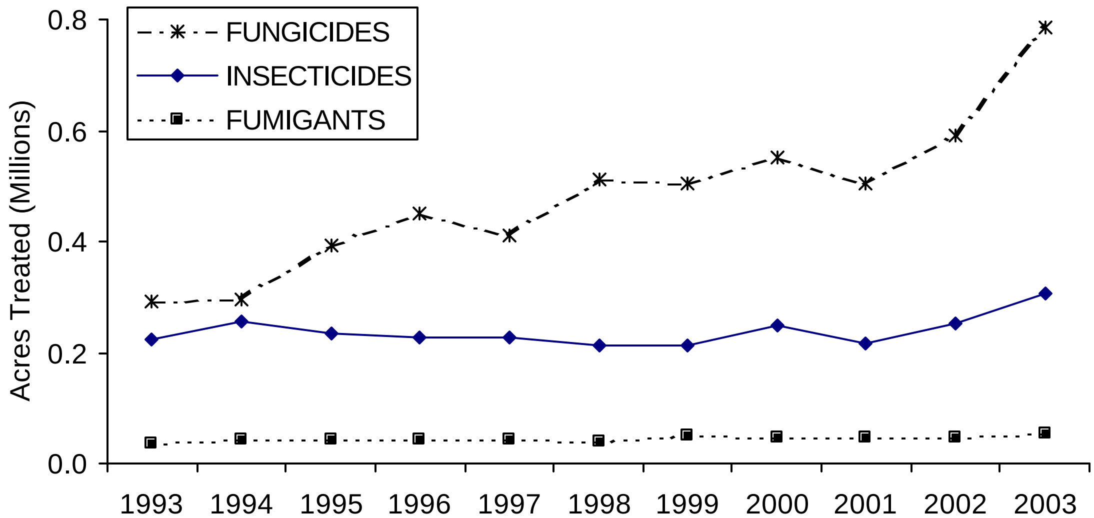
Table 21A. Total reported pounds of all AIs, acres treated, acres planted, and prices for strawberries each year from 1998 to 2003. Harvested acres in 1998 to 2001 are from CDFA, 2002; harvested acres in 2002 and 2003 are from Noncitrus Fruits and Nuts 2003 Summary, USDA, July 2004; all marketing year average prices are from NASS, July 2004.

	1999	2000	2001	2002	2003
Lbs AI	8,846,907	7,742,885	7,892,756	8,208,032	9,175,187
Acres Treated	899,059	1,018,119	874,220	981,755	1,265,969
Acres Harvested	25,800	27,600	26,400	28,500	29,600
Price $/cwt	$72.50	$61.40	$70.60	$67.40	$72.80

Table 21B. Percent difference from previous year for reported pounds of all AIs, acres treated, acres planted, and prices for strawberries from 1999 to 2003.

	1999	2000	2001	2002	2003
Lbs AI	22	-12	2	4	12
Acres Treated	5	13	-14	12	29
Acres Harvested	7	7	-4	8	4
Price $/cwt	6	-15	15	-5	8

Figure 19. Acres of strawberries treated by all active ingredients in the major types of pesticides from 1993 to 2003.



In terms of acres treated, total pesticide use has increased most years from 1993 to 2003; fungicides and insecticides accounts for nearly all of this increase. The greatest increase in use occurred between 2002 and 2003, which saw fungicide use increase by 33%, fumigant use by 11%, and insecticide use by 20%. The major pesticides with greatest increased percentage of acres treated from 2002 to 2003 were pyraclostrobin, triflumizole, pyriproxyfen, bifenazate, 1,3-D. The major pesticides with greatest decreased use were benomyl, azadirachtin, diazinon, carbaryl, and iprodione. Most of the pesticides used, as measured by acres treated, were fungicides. The major fungicides by acres treated in 2003 were captan, sulfur, fenhexamid, myclobutanil, and pyraclostrobin. The major insecticides were *Bacillus thuringiensis*, malathion, spinosad, methomyl, and bifenazate. The major fumigants were chloropicrin, methyl bromide, 1,3-dichloropropene (1,3-D), and metam-sodium.

The California Strawberry Commission's acreage survey for the 2003 season reported a total of 28,230 acres. The reported increase over 2002 acreage was 1,401 acres or an additional 5.2 percent with all counties showing an increase. Ventura County had the highest increase with 31.1 percent and San Joaquin County the lowest increase with 1.5 percent. The acreage increase was due to a favorable market and the increase in summer planted strawberries. The organic acreage increased by 59 percent (from 383 acres in 2002 to 607 acres in 2003) due to a high demand for organically grown strawberries.

The older registered fungicides (captan, thiram, thiophanate-methyl, and benomyl) and the newly registered fenhexamid, fludioxonil and cyprodinil are generally used to control Botrytis fruit rot, a major disease of strawberries. Their use in terms of pounds applied increased in 2003, except for benomyl and thiram. This increase was likely due to increased acreage, specifically of summer planted strawberries, and favorable weather conditions for the development of Botrytis fruit rot. Thiram was likely replaced by captan for resistance management. Use of thiophanate-methyl increased by 104 percent in 2003, replacing benomyl as a systemic and inexpensive fungicide. The manufacturer voluntarily canceled benomyl.

Conventional strawberry growers primarily used sulfur and myclobutanil to control powdery mildew. Sulfur is cheap and is also used by organic growers. Increased acreage of both conventional and organic growers coupled with favorable weather conditions for disease development might have also contributed to the increased use of sulfur. Pyraclostrobin, first reported in 2003, is a new and effective fungicide for powdery mildew control. Azoxystrobin is another new fungicide for strawberries that is very effective against anthracnose, a disease that was not as severe in 2003 as in 2002. Its use decreased by 29 percent.

Strawberry production relies on several fumigants, including methyl bromide, 1,3–D, chloropicrin, and metam sodium. These fumigants usually are applied at higher rates than other pesticides types, such as fungicides and insecticides. Fumigants are applied at high rates, in part, because they treat a volume of space rather than a surface area such as leaves and stems of plants. Thus, the pounds applied are large relative to other pesticide types even though the number of applications or number of acres treated may be relatively small. Fumigants accounted for about 88 percent of all pesticide AIs by pounds applied in strawberries. Methyl bromide use decreased 1 percent (from 3,706,589 pounds in 2002 to 3,671,982 pounds in 2003). This decrease in methyl bromide use was likely due to increased restrictions that DPR placed on field applications in the last several years and use of less costly replacements. Growers were replacing methyl bromide with 1,3–D formulated with various percentages of chloropicrin, chloropicrin alone, and metam sodium. 1,3–D use in pounds and acres treated with this fumigant increased 101 percent and 102 percent respectively in 2003. Chloropicrin use and acres treated both increased respectively 13 percent and 12 percent. Acres treated with metam sodium decreased by 18 percent. This fumigant is generally more effective in controlling weeds, but less against soil-borne diseases and nematodes. Regulatory restrictions might also have resulted in its decreased use.

Use of all major broad-spectrum insecticides, such as malathion, methomyl, naled, fenpropathrin, and chlorpyrifos, increased due to increased acreage and pest pressure (mites, whiteflies, lygus, and worms) in 2003. Use of petroleum oil (two-spotted spider mite control) and Bt (worm control) increased in terms of pounds applied and acres treated. Pyriproxyfen, a newly registered insect growth regulator, is effective against white flies. Some of the increased insecticide use might also be due to less use of methyl bromide and the change (from broadcast to bed fumigation) in the way methyl bromide alternatives were applied in 2003. For instance, this change might have increased the usage of chlorpyrifos for various worm control. Bifenazate became available in 2002 for strawberries. It is an effective alternative for the control of two-spotted spider mites. Most conventional growers used this miticide in 2003.

Herbicide use accounts for less than 0.5% of acres treated and less than 0.1% by pounds of AI. Nevertheless, strawberry production depends on the use of herbicides such as napropamide, paraquat dichloride, oxyfluorfen, and glyphosate. Their use increased by 41 percent in 2003. The increase of herbicides was likely due to the increasing dependence on methyl bromide alternatives that are not effective against weeds and the increasing change in the way they are applied; from broadcast to bed fumigation. They are also cheap. Oxyfluorfen is specifically used to control malva, a troublesome weed that is not controlled by methyl bromide fumigation or any other herbicide currently registered for strawberries. The increased use of oxyfluorfen was likely due to growers' dependence on it to control malva and increased acreage.

Carrots

California ranks among the top in the U.S. in the production of carrots. Carrots are grown for fresh market and processing. California has five main production regions for carrots: the San Joaquin Valley (Kern County), with significant production in Cuyama Valley (San Luis Obispo County); the low desert (Imperial Valley and Riverside Counties); the high desert (Los Angeles County); and the central coast (Monterey County).

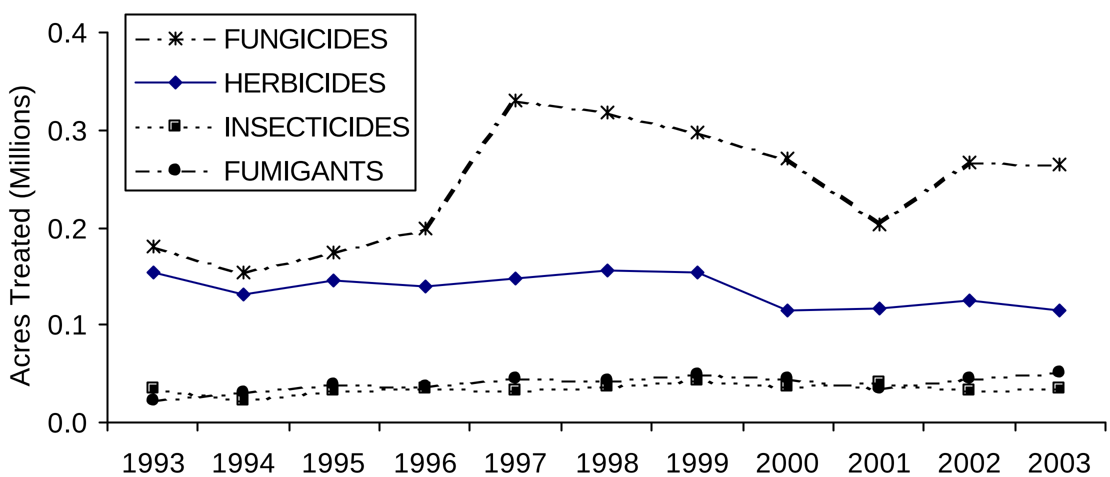
Table 22A. Total reported pounds of all AIs, acres treated, acres planted, and prices for carrots each year from 1998 to 2003. Harvested acres of all carrots in 1998 to 2001 are from CDFA, 2002; harvested acres in 2002 and 2003 are from California Vegetable Review, CASS, January 2004; all marketing year average prices for fresh carrots are from NASS, July 2004.

	1999	2000	2001	2002	2003
Lbs AI	8,626,103	7,582,107	6,506,317	7,823,438	8,613,683
Acres Treated	489,268	412,294	359,358	427,102	446,635
Acres Harvested	87,900	85,400	84,300	79,100	77,000
Price $/cwt	$17.20	$13.30	$18.10	$20.30	$20.50

Table 22B. Percent difference from previous year for reported pounds of all AIs, acres treated, acres planted, and prices for carrots from 1999 to 2003.

	1999	2000	2001	2002	2003
Lbs AI	12	-12	-14	20	10
Acres Treated	-2	-16	-13	19	5
Acres Harvested	-3	-3	-1	-6	-3
Price $/cwt	51	-23	36	12	1

Figure 20. Acres of carrots treated by all AIs in the major types of pesticides from 1993 to 2003.



Pesticide use in carrots remained fairly constant from year to year except for an increase in fungicide use from 1997 to 2000 and a generally increasing fumigant use. From 2002 to 2003 fumigant use increased by 11% which is a typical yearly increase for fumigants in carrots. The major pesticides with increased percentage acres treated were pyraclostrobin, malathion, gibberellins, clethodim, and spinosad. The major pesticides with decreased percentage were tau-fluvalinate, fluazifop-p-butyl, cyfluthrin, azoxystrobin, and bifenthrin. The most applied fungicides in 2003 were mefenoxam, iprodione, chlorothalonil, copper hydroxide, and sulfur. The main herbicides were linuron, trifluralin, fluazifop-p-butyl, clethodim, and glyphosate. The fumigants used were metam-sodium, 1,3-D, and chloropicrin. The major insecticides were esfenvalerate, diazinon, methomyl, spinosad, and cyfluthrin.

Most of the pesticides used, as measured by acres treated, were fungicides. Alternaria leaf blight, a major foliar disease, is generally controlled by iprodione, chlorothalonil, pyraclostrobin (registered in 2003), or azoxystrobin. In 2003, growers relied more on chlorothalonil and pyraclostrobin than on iprodione (due to resistance) and azoxystrobin (expensive) to control Alternaria leaf blight. Their increased use also might be due to favorable weather conditions for Alternaria leaf blight development.

Cavity spot is a major, troublesome root disease that is commonly controlled by applying mefenoxam or metam sodium. Growers might have relied more on metam sodium use to manage this root disease in 2003, resulting in a decreased use of mefenoxam. Repeated applications of mefenoxam to soil can increase the activity of microorganisms that degrade it, reducing its efficacy against cavity spot.

Sulfur is used primarily to control powdery mildew. Azoxystrobin is an alternative to sulfur, but is more expensive.

Linuron and trifluralin are two key herbicides in carrot production. Linuron, a postemergence herbicide, provides good control of broadleaf weeds, small grasses, and yellow nutsedge. Trifluralin is used by carrot growers in their weed management to complement linuron. Decreased use of linuron might be due to the decline in harvested acres in 2003. There are no alternatives to this herbicide.

Carrot production relies on the fumigants 1,3–D, chloropicrin, and metam sodium. These fumigants are used at high rates to control soil-borne pests. Methyl bromide is no longer used on carrots. In 2003, fumigants accounted for about 84 percent of the total pounds of pesticide AIs applied to carrots. Acres treated and pounds of 1,3–D used increased respectively by 16 and 22 percent in 2003. More fields might have required fumigation in 2003 than in 2002 due to nematode or fungal infestation, or both. Chloropicrin use also increased (56 percent more acres were treated in 2003); however, chloropicrin is not used by itself in carrot production. It is contained in a formulation of 1,3–D; therefore, the increase in chloropicrin use is likely due to the increased use of 1,3–D. The use of metam sodium increased slightly in 2003.

Insects are generally not a major problem in carrot production, except for white flies that are controlled with esfenvalerate. In 2003, pounds of esfenvalerate use and acres treated increased 20 and 17 percent, respectively, due to increased pest pressure.

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VI. SUMMARY OF PESTICIDE USE REPORT DATA 2003 INDEXED BY COMMODITY

The following report presents information of statewide pesticide use for 2003. For each commodity, the chemical that was used, total pounds applied, the number of agricultural applications made, and the amount of commodity treated are summarized.

A summary by chemical is presented in a separate report, *Summary of Pesticide Use Report Data 2003 Indexed by Chemical*. Both versions of the Pesticide Use Report can be purchased from DPR or downloaded from the DPR web site at www.cdpr.ca.gov.